

Issue Classification 	Application/Control No. 16/191,503	Applicant(s)/Patent Under Reexamination Sarder et al.
	Examiner KEVIN A LATHERS	Art Unit 3747

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1	9	10		19										
1	2		11		20										
6	3		12		21										
7	4		13	11	22										
8	5		14		23										
2	6		15	10	24										
3	7		16												
4	8		17												
5	9		18												

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 11	
/KEVIN A LATHERS/ Primary Examiner, Art Unit 3747 (Primary Examiner) _____ (Date) 30 September 2022		O.G. Print Claim(s) 2	O.G. Print Figure 1



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

26629 7590 09/29/2022
ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (ZPS)
136 S WISCONSIN ST
PORT WASHINGTON, WI 53074

EXAMINER

LATHERS, KEVIN ANTHONY

ART UNIT

PAPER NUMBER

3747

DATE MAILED: 09/29/2022

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/191,503	11/15/2018	Mark J. Sarder	CET1090.070	6187

TITLE OF INVENTION: OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$600	\$0.00	\$0.00	\$600	12/29/2022

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

26629 7590 09/29/2022
ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (ZPS)
136 S WISCONSIN ST
PORT WASHINGTON, WI 53074

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/191,503	11/15/2018	Mark J. Sarder	CET1090.070	6187

TITLE OF INVENTION: OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$600	\$0.00	\$0.00	\$600	12/29/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
LATHERS, KEVIN ANTHONY	3747	123-575000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

1 _____

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/191,503	11/15/2018	Mark J. Sarder	CET1090.070	6187
26629	7590	09/29/2022	EXAMINER	
ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (ZPS)			LATHERS, KEVIN ANTHONY	
136 S WISCONSIN ST			ART UNIT	
PORT WASHINGTON, WI 53074			PAPER NUMBER	
			3747	
DATE MAILED: 09/29/2022				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection, or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 16/191,503	Applicant(s) Sarder et al.	
	Examiner KEVIN A LATHERS	Art Unit 3747	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to claims filed 08/11/2022.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☐ The allowed claim(s) is/are _____. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☐ All b) ☐ Some* c) ☐ None of the:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)	5. ☐ Examiner's Amendment/Comment
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____.	

/KEVIN A LATHERS/ Primary Examiner, Art Unit 3747	
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DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Allowable Subject Matter

2. Claims 2-10, 22, and 24 are allowed.

Conclusion

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEVIN A LATHERS whose telephone number is (571)272-1050. The examiner can normally be reached M-F 10a-6p.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lindsay Low can be reached on 5712721196. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/KEVIN A LATHERS/
Primary Examiner, Art Unit 3747

Issue Classification 	Application/Control No. 16/191,503	Applicant(s)/Patent Under Reexamination Sarder et al.
	Examiner KEVIN A LATHERS	Art Unit 3747

CPC						
Symbol					Type	Version
F02D	/	19	/	0613	F	2013-01-01
F02D	/	19	/	0605	I	2013-01-01
F02D	/	19	/	0647	I	2013-01-01
F02D	/	19	/	0673	I	2013-01-01
Y02T	/	10	/	30	A	2013-01-01

CPC Combination Sets					
Symbol				Type	Version
/	/	/	/		

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	11	
/KEVIN A LATHERS/ Primary Examiner, Art Unit 3747	21 September 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	2	1

Issue Classification 	Application/Control No. 16/191,503	Applicant(s)/Patent Under Reexamination Sarder et al.
	Examiner KEVIN A LATHERS	Art Unit 3747

INTERNATIONAL CLASSIFICATION			
CLAIMED			
F02D19/06	/	19	/ 06

NON-CLAIMED			
/	/		

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	11	
/KEVIN A LATHERS/ Primary Examiner, Art Unit 3747	21 September 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	2	1

Issue Classification 	Application/Control No. 16/191,503	Applicant(s)/Patent Under Reexamination Sarder et al.
	Examiner KEVIN A LATHERS	Art Unit 3747

☐ Claims renumbered in the same order as presented by applicant
 ☐ CPA
 ☐ T.D.
 ☐ R.1.47

CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1	9	10		19										
1	2		11		20										
6	3		12		21										
7	4		13	11	22										
8	5		14		23										
2	6		15	10	24										
3	7		16												
4	8		17												
5	9		18												

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 11	
/KEVIN A LATHERS/ Primary Examiner, Art Unit 3747 (Primary Examiner) _____ (Date) 21 September 2022		O.G. Print Claim(s) 2	O.G. Print Figure 1

<i>Search Notes</i> 	Application/Control No. 16/191,503	Applicant(s)/Patent Under Reexamination Sarder et al.
	Examiner KEVIN A LATHERS	Art Unit 3747

CPC - Searched*		
Symbol	Date	Examiner
F02D19/0613, 19/0605, 19/0647	03/05/2019	/K.L./
Y02T10/36	03/05/2019	/K.L./

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Google and EAST including inventor and assignee search.	03/05/2019	/K.L./
Google and EAST search.	08/27/2019	/K.L./
Google and EAST search.	04/22/2020	/K.L./
Google, EAST, IP.com search.	10/23/2020	/K.L./
Interference search.	09/21/2022	/K.L./

/KEVIN A LATHERS/ Primary Examiner, Art Unit 3747	
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<i>Search Notes</i> 	Application/Control No. 16/191,503	Applicant(s)/Patent Under Reexamination Sarder et al.
	Examiner KEVIN A LATHERS	Art Unit 3747

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
F02D	19/0613, 19/0605, 19/0647	09/21/2022	/K.L./

/KEVIN A LATHERS/ Primary Examiner, Art Unit 3747	
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<i>Index of Claims</i> 	Application/Control No. 16/191,503	Applicant(s)/Patent Under Reexamination Sarder et al.
	Examiner KEVIN A LATHERS	Art Unit 3747

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	08/27/2019	04/22/2020	10/23/2020	06/10/2021	09/21/2022				
	1	✓	✓	✓	✓	-				
1	2	✓	○	✓	✓	=				
6	3	✓	○	✓	✓	=				
7	4	✓	○	✓	✓	=				
8	5	✓	○	✓	✓	=				
2	6	✓	✓	✓	✓	=				
3	7	✓	✓	✓	✓	=				
4	8	✓	✓	✓	✓	=				
5	9	✓	✓	✓	✓	=				
9	10	✓	✓	✓	✓	=				
	11	✓	✓	✓	✓	-				
	12	✓	✓	✓	✓	-				
	13	✓	✓	✓	✓	-				
	14	✓	✓	✓	✓	-				
	15	✓	✓	✓	✓	-				
	16	✓	✓	✓	✓	-				
	17	✓	✓	✓	✓	-				
	18	-	-	-	-	-				
	19	-	-	-	-	-				
	20	-	-	-	-	-				
	21	✓	✓	✓	✓	-				
11	22	✓	✓	✓	✓	=				
	23	✓	✓	-	-	-				
10	24			✓	✓	=				

Bibliographic Data

Application No: 16/191,503

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /KEVIN A LATHERS/

Examiner's Signature

Initials

Title: OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/15/2018	123	3747	
RULE			

APPLICANTS

Champion Power Equipment, Inc., Santa Fe Springs, CA, UNITED STATES

INVENTORS

Mark J. Sarder, Waukesha, WI, UNITED STATES

Aleko D. Sotiriades, Cedarburg, WI, UNITED STATES

James J. Dehn, Brookfield, WI, UNITED STATES

Leigh Jenison, Hartland, WI, UNITED STATES

CONTINUING DATA

This application is a CON of 14738060 06/12/2015 PAT 10221780

FOREIGN APPLICATIONS

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Doc code: IDS

PTO/SB/08a (02-18)

Doc description: Information Disclosure Statement (IDS) Filed

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	16191503
Filing Date	2018-11-15
First Named Inventor	Mark J. Sarder et al.
Art Unit	3747
Examiner Name	Kevin A. Lathers
Attorney Docket Number	CET1090.070

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	1	4287908		1981-09-08	Storgard	
	2	4364370		1982-12-21	Smith et al.	
	3	4416244		1983-11-22	McDonald	
	4	5555873		1996-09-17	Nolen	
	5	7954479	B2	2011-06-07	Kojima et al.	
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1	20070215223	A1	2007-09-20	Morris
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	1	1826377	EP	A2	2007-08-29	Rotarex Star		
	2	2510660	FR	A1	1983-02-04	Stetter SA		
	3	H0466743	JP	A	1992-03-03	Suzuki Motor Co		
	4	1999001659	WO	A1	1999-01-14	Bailey		
	5	2007048633	WO	A1	2007-05-03	Dirnhofer		
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1	Yamaha EF2000iS Tri Fuel Conversion: Overview & Installation Tips, January 3, 2014, https://www.youtube.com/watch?v=caZawwDaRQg
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Filing Date	2018-11-15
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Examiner Name	Kevin A. Lathers
Attorney Docket Number	CET1090.070

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Andrew C. Stark/	Date (YYYY-MM-DD)	2022-08-11
Name/Print	Andrew C. Stark	Registration Number	65742

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1434	F02D19/0613.cpc.	(US-PGPUB; USPAT; USOCR; FIT (CN, FR, WO, JP, EP, KR); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/21 09:17 PM
L3	7269	F02D19/0647.cpc.	(US-PGPUB; USPAT; USOCR; FIT (CN, FR, WO, JP, EP, KR); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/21 09:17 PM
L4	2144	F02D19/0605.cpc.	(US-PGPUB; USPAT; USOCR; FIT (CN, EP, FR, JP, KR, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/21 09:17 PM
L5	0	(dual ADJ fuel ADJ generator AND pressure ADJ regulator AND fuel ADJ valve AND mechanical).clm.	(US-PGPUB; USPAT; USOCR; FIT (CN, EP, FR, JP, KR, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/21 09:18 PM

PE2E SEARCH - Search History (Interference)

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N2	306	F02D19/0605.cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/21 09:18 PM
N3	922	F02D19/0647.cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/21 09:18 PM
N4	143	F02D19/0613.cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/21 09:18 PM
N5	3	(dual ADJ fuel ADJ generator AND pressure ADJ regulator AND fuel ADJ valve AND mechanical).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/21 09:18 PM



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/191,503	11/15/2018	3747	785	CET1090.070	20	3

26629
ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (ZPS)
136 S WISCONSIN ST
PORT WASHINGTON, WI 53074

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Date Mailed: 09/22/2022

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Inventor(s)

Mark J. Sarder, Waukesha, WI;
Aleko D. Sotiriades, Cedarburg, WI;
James J. Dehn, Brookfield, WI;
Leigh Jenison, Hartland, WI;

Applicant(s)

Champion Power Equipment, Inc., Santa Fe Springs, CA;

Power of Attorney: The patent practitioners associated with Customer Number 26629

Domestic Priority data as claimed by applicant

This application is a CON of 14/738,060 06/12/2015 PAT 10221780

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/191,503**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE

Preliminary Class

123

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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James J. Dehn, Brookfield, WI;
Leigh Jenison, Hartland, WI;

Applicant(s)

Champion Powe Equipment, Inc., Santa Fe Springs, CA;

Assignment For Published Patent Application

Champion Powe Equipment, Inc., Santa Fe Springs, CA

Power of Attorney: The patent practitioners associated with Customer Number 26629

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Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

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Title

OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/191,503	11/15/2018	Mark J. Sarder	CET1090.070

CONFIRMATION NO. 6187

POA ACCEPTANCE LETTER

26629
ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (ZPS)
136 S WISCONSIN ST
PORT WASHINGTON, WI 53074



Date Mailed: 09/19/2022

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 09/08/2022.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/rmohamed/



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/191,503	11/15/2018	Mark J. Sarder	CET1090.070	6187
26629	7590	09/14/2022		
ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (ZPS)			EXAMINER	
136 S WISCONSIN ST			LATHERS, KEVIN ANTHONY	
PORT WASHINGTON, WI 53074				
			ART UNIT	PAPER NUMBER
			3747	
			NOTIFICATION DATE	DELIVERY MODE
			09/14/2022	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

info@zpspatents.com
jmf@zpspatents.com
lje@zpspatents.com

<i>Applicant-Initiated Interview Summary</i>	Application No. 16/191,503	Applicant(s) Sarder et al.		
	Examiner KEVIN A LATHERS	Art Unit 3747	AIA (First Inventor to File) Status Yes	Page 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	Title	Type
KEVIN A LATHERS	Primary Examiner	Telephonic
Andrew Stark	Attorney	

Date of Interview: 07 September 2022

Issues Discussed:

Other

Applicant's Terminal Disclaimer was denied. Examiner and Attorney discussed ways to overcome the issues presented in a timely manner.

/KEVIN A LATHERS/ Primary Examiner, Art Unit 3747	
Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04 Please further see: MPEP 713.04 Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b) 37 CFR § 1.2 Business to be transacted in writing	

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

<i>Application Number</i> * 16/191,503 *	Application/Control No. 16/191,503	Applicant(s)/Patent under Reexamination Sarder et al.	
	Examiner LATHERS, KEVIN ANTHONY	Art Unit 3747	
Document Code - DISQ		Internal Document - DO NOT MAIL	

TERMINAL DISCLAIMER	☒ APPROVED	☐ DISAPPROVED
Date Filed: <u>08 September 2022</u>	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
/TRINA STEPTOE/ Technology Center: <u>OPLC</u> Telephone: <u>(571)272-2577</u> <u>10,221,780</u>



ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
16/191,503

RECEIPT DATE / TIME
09/08/2022 03:16:24 PM ET

ATTORNEY DOCKET #
CET1090.070

Title of Invention

DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 6187

FILED BY Robyn Templin

PATENT CENTER # 60949719

FILING DATE 11/15/2018

CUSTOMER # 26629

FIRST NAMED
INVENTOR Mark J. Sarder

CORRESPONDENCE
ADDRESS -

AUTHORIZED BY Andrew Stark

Documents

TOTAL DOCUMENTS: 6

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2022.09.08 ADS.pdf	9	Application Data Sheet	1619 KB
Warning: This is not a USPTO supplied ADS fillable form. Data in the form cannot be automatically loaded to other USPTO systems.			
2022.09.08 POA Transmittal.pdf	1	Power of Attorney	151 KB
2022.09.08 General POA.pdf	1	Power of Attorney	532 KB
2022.09.08 Request to Correct Applicant.pdf	2	Request under 37CFR1.46(c) to correct, update, change applicant	189 KB

2022.09.08 Statement Under 37 CFR 3.73c.pdf	3	Assignee showing of ownership per 37 CFR 3.73	124 KB
2022.09.08 Terminal Disclaimer.pdf	1	Terminal Disclaimer Filed	90 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
2022.09.08 ADS.pdf	7E2D6937627ADD2CE801894993719288C259558574D62DEA3A 4FA266A3B41690F9BC92E80EFD20AFF7D82B17DEB943BB43C 0909655A8264F4A74CEB99AB398B2
2022.09.08 POA Transmittal.pdf	727FA98E32C71266FEF3A8986F22ACABE6ED221D9BC109C82 A183884DB2D7596A6EC21D2F227075F9F583A4E42108B84883 82F3EB81194F1CE3DB4F0A7AB046B
2022.09.08 General POA.pdf	EEE57956C00EA36439F3ECE88A916468E3E89FD7148120590B EA9FD6029EA56802800079ABA1694B6C5ACAAE418CC562026 80338D97979D157FAA73230CFFEB7
2022.09.08 Request to Correct Applicant.pdf	A01B82E12F0D2317F4BC76B092B54FE1A96C8245B8F310551A 193CD37BCD28D6D1DFA4354C427DE3CA9DC0BDB1AB450C4 3AF7A8F9922074857CC27E6EA3A97B3
2022.09.08 Statement Under 37 CFR 3.73c.pdf	B96BC8262BD799901D90E7203200BF731EFAE9C3D64E91B6D F8A770A97BE0FF1419A7D54FCC857EC75AD4D97B41D02C56 B7DA8820CF343A10B730B51C574C8CB
2022.09.08 Terminal Disclaimer.pdf	E4B2E0E976609A2D988E380ED26467539071E8C868390CE1A8 CC9F36BD8E4D9032BEC05AA1E369280973053A50CEE3CE200 923F6B5DC791029B9FB8C25A34271

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING
REJECTION OVER A "PRIOR" PATENT**

Docket Number (Optional)
CET1090.070

In re Application of: Sarder, et al.

Application No.: 16/191,503

Filed: 11/15/2018

For: OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE

The applicant, Champion Power Equipment, Inc., owner of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term **prior patent** No. 10,221,780 as the term of said **prior patent** is presently shortened by any terminal disclaimer. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the applicant does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ The undersigned is the applicant. If the applicant is an assignee, the undersigned is authorized to act on behalf of the assignee.

I hereby knowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

2. ☒ The undersigned is an attorney or agent of record. Reg. No. 65742

/Andrew C. Stark/ September 8, 2022
Signature Date

Andrew C. Stark
Typed or printed name

Attorney (262) 268-8100
Title Telephone Number

- ☐ Terminal disclaimer fee under 37 CFR 1.20(d) included.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

This collection of information is required by 37 CFR 1.321. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CET1090.070
		Application Number	16/191,503
Title of Invention	~~DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE~~ OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--

Inventor Information:

Inventor 1					Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Mark	J.	Sarder			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
City	Waukesha	State/Province	WI	Country of Residence	US	
Mailing Address of Inventor:						
Address 1		W245 N5551 Corporate Circle				
Address 2						
City	Sussex	State/Province	WI			
Postal Code	53089	Country	US			
Inventor 2					Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Aleko	D.	Sotiriades			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
City	Cedarburg	State/Province	WI	Country of Residence	US	
Mailing Address of Inventor:						
Address 1		W245 N5551 Corporate Circle				
Address 2						
City	Sussex	State/Province	WI			
Postal Code	53089	Country	US			
Inventor 3					Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	James	J.	Dehn			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CET1090.070
		Application Number	<u>16/191,503</u>
Title of Invention	~~DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE~~ <u>OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE</u>		

City	Brookfield	State/Province	WI	Country of Residence	US
------	------------	----------------	----	----------------------	----

Mailing Address of Inventor:

Address 1	W245 N5551 Corporate Circle				
Address 2					
City	Sussex		State/Province	WI	
Postal Code	53089		Country	US	

Inventor 4	Remove
Legal Name	

Prefix	Given Name	Middle Name	Family Name	Suffix
	Leigh		Jenison	

Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service

City	Hartland	State/Province	WI	Country of Residence	US
------	----------	----------------	----	----------------------	----

Mailing Address of Inventor:

Address 1	W245 N5551 Corporate Circle				
Address 2					
City	Sussex		State/Province	WI	
Postal Code	53089		Country	US	

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. [Add](#)

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).	
☐ An Address is being provided for the correspondence Information of this application.	
Customer Number	26629
Email Address	Add Email Remove Email

Application Information:

Title of the Invention	~~DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE~~ <u>OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE</u>		
Attorney Docket Number	CET1090.070	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)		Suggested Figure for Publication (if any)	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CET1090.070
		Application Number	<u>16/191,503</u>
Title of Invention	~~DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE~~ OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE		

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	26629		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	~~Pending~~	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	~~Continuation of~~	~~44738060~~	~~2016-06-12~~

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CET1090.070		
		Application Number	16/191,503		
Title of Invention	~~DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE~~ OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE				
Prior Application Status		<u>Patented</u>		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
	<u>Continuation of</u>	<u>14738060</u>	<u>2015-06-12</u>	<u>10221780</u>	<u>2019-03-05</u>
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.					

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove			
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CET1090.070
		Application Number	<u>16/191,503</u>
Title of Invention	~~DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE~~ <u>OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE</u>		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CET1090.070
		Application Number	<u>16/191,503</u>
Title of Invention	~~DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE~~ OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
Applicant 1			
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
Clear			
☒ Assignee		☐ Legal Representative under 35 U.S.C. 117	
☐ Person to whom the inventor is obligated to assign.		☐ Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name	~~Champion Engine Technology, LLC~~ <u>Champion Power Equipment, Inc.</u>		
Mailing Address Information For Applicant:			
Address 1	~~W245 N5551 Corporate Circle~~ <u>12039 Smith Avenue</u>		
Address 2			
City	~~Sussex~~ <u>Santa Fe Springs</u>	State/Province	~~WA~~ <u>CA</u>
Country	US	Postal Code	~~53009~~ <u>90670</u>
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button.			

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CET1090.070
		Application Number	<u>16/191,503</u>
Title of Invention	~~DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE~~ <u>OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE</u>		

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		State/Province	
Country ⁱ		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Andrew Stark/		Date (YYYY-MM-DD)	2022-09-08
First Name	Andrew	Last Name	Stark	Registration Number
65742				

Additional Signature may be generated within this form by selecting the Add button.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CET1090.070
		Application Number	<u>16/191,503</u>
Title of Invention	~~DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE~~ <u>OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE</u>		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Doc Code: R46C.REQ

Document Description: Request under 37 CFR 1.46(c) to correct, update or change the applicant.

PTO/AIA/41 (04-15)

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**REQUEST TO CORRECT OR UPDATE
THE NAME OF THE APPLICANT UNDER
37 CFR 1.46(c)(1), OR CHANGE THE
APPLICANT UNDER 37 CFR 1.46(c)(2)
(FOR USE ONLY IN APPLICATIONS FILED ON OR AFTER
SEPTEMBER 16, 2012)**

Application Number	16/191,503
Filing Date	November 15, 2018
First Named Inventor	Mark J. Sarder
Art Unit	3747
Examiner Name	Kevin A. Lathers
Practitioner Docket Number	CET1090.070

**To: Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450**

Applicant hereby **requests that the name of the applicant be corrected or updated under 37 CFR 1.46(c)(1), or that the applicant be changed under 37 CFR 1.46(c)(2),** in the above-identified application. **Requests under 37 CFR 1.46(c)(1) or (c)(2) cannot be submitted after payment of the issue fee or if the application has been patented.**

Please check the applicable box(es) below.

☐ 1. This request is to **correct or update the name of the applicant (under 37 CFR 1.46(c)(1))** and includes:

☐ An application data sheet (ADS) in accordance with 37 CFR 1.76(c) with the corrected or updated information shown with markings (e.g., underlining for insertions, strikethrough for deletions). A Corrected Web-based ADS may be used.

Note: Requests under 37 CFR 1.46(c)(1) may be filed to correct typographical errors in the name of the § 1.46 applicant, or for updating the name of the § 1.46 applicant (i.e., where there is no change in the applicant itself but just in the applicant's name). See the Manual of Patent Examining Procedure (MPEP) section 605.01.

☒ 2. This request is to **change the applicant (under 37 CFR 1.46(c)(2))** and includes:

☒ An application data sheet (ADS) in accordance with 37 CFR 1.76(c) that identifies the changes with proper markings (underlining for insertions and strikethrough for deletions). A Corrected Web-based ADS may be used.

☒ A Statement Under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent). See MPEP 325.

I am the

☐ applicant*

☒ attorney or agent of record

Registration number 65742

☐ attorney or agent acting under 37 CFR 1.34

Registration number _____

Signature /Andrew C. Stark/

Typed or printed name Andrew C. Stark

Date September 8, 2022

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. *Juristic entities must be represented by a patent practitioner (See 37 CFR 1.31, applicable to any paper filed on or after September 16, 2012 that is presented on behalf of a juristic entity, regardless of application filing date). Submit multiple forms if more than one signature is required, see below**.

☒ ** Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.36. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND**

TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
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8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)Applicant/Patent Owner: Champion Power Equipment, Inc.Application No./Patent No.: 16/191,503 Filed/Issue Date: November 15, 2018Titled: OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINEChampion Power Equipment, Inc., a corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☒ The assignee of the entire right, title, and interest.
2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):
- ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.
- ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (e.g., bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

- A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.
- B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Mark J. Sarder To: Champion Engine Technology, LLC

The document was recorded in the United States Patent and Trademark Office at

Reel 047507, Frame 0658, or for which a copy thereof is attached.2. From: Aleko D. Sotiriades To: Champion Engine Technology, LLC

The document was recorded in the United States Patent and Trademark Office at

Reel 047507, Frame 0658, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Petitioner MWE Investments, LLC, et al.
Exhibit 1003, Page 249

STATEMENT UNDER 37 CFR 3.73(c)3. From: James J. Dehn To: Champion Engine Technology, LLCThe document was recorded in the United States Patent and Trademark Office at
Reel 047507, Frame 0658, or for which a copy thereof is attached.4. From: Leigh Jenison To: Champion Engine Technology, LLCThe document was recorded in the United States Patent and Trademark Office at
Reel 047507, Frame 0658, or for which a copy thereof is attached.5. From: Champion Engine Technology, LLC To: Champion Power Equipment, Inc.The document was recorded in the United States Patent and Trademark Office at
Reel 047681, Frame 0698, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.☐ Additional documents in the chain of title are listed on a supplemental sheet(s).☒ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Andrew C. Stark/

Signature

Andrew C. Stark

Printed or Typed Name

September 8, 2022

Date

65,742

Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	16/191,503
Filing Date	November 15, 2018
First Named Inventor	Mark J. Sarder
Title	OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE
Art Unit	3747
Examiner Name	Kevin A. Lathers
Attorney Docket Number	CET1090.070

SIGNATURE of Applicant or Patent Practitioner

Signature	/Andrew C. Stark/	Date (Optional)	2022-09-08
Name	Andrew C. Stark	Registration Number	65742
Title (if Applicant is a juristic entity)	Patent Practitioner		
Applicant Name (if Applicant is a juristic entity)	Champion Power Equipment, Inc.		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.



*Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number

Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)



I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:

26629

OR



I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:



The address associated with the above-mentioned Customer Number

OR



The address associated with Customer Number:

OR



Firm or
Individual Name

Address

City

State

Zip

Country

Telephone

Email

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):



Inventor or Joint Inventor (title not required below)



Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)



Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)



Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature

Date (Optional)

01-05-2019

Name

Dennis Trine

Title

Chief Executive Officer, Champion Power Equipment, Inc.

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.



Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. This information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Application Number * 16/191,503 *	Application/Control No. 16/191,503	Applicant(s)/Patent under Reexamination Sarder et al.	
	Examiner LATHERS, KEVIN ANTHONY	Art Unit 3747	
Document Code - DISQ		Internal Document - DO NOT MAIL	

TERMINAL DISCLAIMER	☐ APPROVED	☒ DISAPPROVED
Date Filed: <u>11 August 2022</u>	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
/KIMBERLY R WHITE/ Technology Center: <u>OPLC</u> Telephone: <u>(571)272-6179</u> <u>See Continuation Sheet</u>

Continuation of Approved/Disapproved Comments:

The title listed on the TD form doesn't match what's listed on the ADS. POA is missing No additional fee is required with resubmission.

The person who signed th terminal disclaimer (only for applications filed on or after September 16, 2012 - is not the applicant, patentee or an attorney or agent of record. 37 CFR I.321(a) and (b). (See FP 14.26.08)

- failed to state his/her capacity to sign for the juristic entity, and he/she has not been established as being authorized to act on behalf of the applicant. (See FP 14.26.09).

(Note: PoA can be given to customer number, wherein all practitioners listed under the customer number have PoA. If PoA is given to a list of practitioners by registration number, the list may not comprise more than 10 practitioners or a separate paper signed by a 37 CFR 1.33(b) party must be in the record identifying which of the practitioners, up to 10, are recognized as having established that the representative is a party authorized to act on behalf of the applicant.)

The terminal disclaimer i entities a party who is not the applicant (only for applications filed on or after September 16, 2012; See FP 14.26. I 0).

**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING
REJECTION OVER A "PRIOR" PATENT**

Docket Number (Optional)
CET1090.070

In re Application of: Sarder, et al.

Application No.: 16/191,503

Filed: 11/15/2018

For: OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE

The applicant, Champion Power Equipment, Inc., owner of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term **prior patent** No. 10,221,780 as the term of said **prior patent** is presently shortened by any terminal disclaimer. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the applicant does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ The undersigned is the applicant. If the applicant is an assignee, the undersigned is authorized to act on behalf of the assignee.

I hereby knowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

2. ☒ The undersigned is an attorney or agent of record. Reg. No. 65742

/Andrew C. Stark/ August 11, 2022
Signature Date

Andrew C. Stark
Typed or printed name

Attorney (262) 268-8100
Title Telephone Number

- ☒ Terminal disclaimer fee under 37 CFR 1.20(d) included.

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Bibliographic data: JPH0466743 (A) — 1992-03-03

TWO-SORT FUEL ENGINE

Inventor(s): MAEDA TADAMASA ± (MAEDA TADAMASA)
Applicant(s): SUZUKI MOTOR CO ± (SUZUKI MOTOR CORP)
Classification: - **international:** *F02D19/06; F02D41/14*; (IPC1-7): F02D19/06;
F02D41/14
- **cooperative:**
Application number: JP19900180942 19900709
Priority number(s): JP19900180942 19900709

Abstract of JPH0466743 (A)

PURPOSE: To realize a control suitable for the properties of fuels in a simple system by using a whole scope air-fuel ratio sensor, and feedback-controlling the air-fuel ratio, the ignition timing, and the like, of the other side fuel while making one side fuel as a standard, in an engine to select and use the fuel from two sorts of different fuels.

CONSTITUTION: The first fuel tank 1 and the second fuel tank 2 to store the first fuel (LPG) and the second fuel (LNG) separately are provided, and at the outlets of the fuel tanks 1 and 2, the first and the second electromagnetic valves 4 and 5 converted by a manual changeover switch 3 (S1) are provided respectively. A fuel passage 6 downstream of the electromagnetic valves 4 and 5 is linked to a two-way electromagnetic valve 8 interlocked with the change-over switch 3 through a vaporizer 7, and regulators 9 and 10 to regulate the pressure of the fuels are connected to the two parts of the two-way solenoid valve 8. These regulators 9 and 10 are connected to an injector 16 through a fuel passage 13. And the output signal of a whole scope air-fuel ratio sensor S2 provided at an exhaust passage 20 are input to the ECU 24, and the control is carried out to correct the other side fuel making one side fuel as a standard.

⑫ 公開特許公報(A) 平4-66743

⑤ Int. Cl.⁵F 02 D 41/14
19/06

識別記号

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庁内整理番号

9039-3G
6502-3G

⑬ 公開 平成4年(1992)3月3日

審査請求 未請求 請求項の数 1 (全4頁)

⑭ 発明の名称 2種燃料エンジン

⑯ 特 願 平2-180942

⑰ 出 願 平2(1990)7月9日

⑱ 発 明 者 前 田 忠 政 静岡県浜松市白羽町231-1
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⑳ 代 理 人 弁理士 佐藤 一雄 外3名

明 細 書

1. 発明の名称

2種燃料エンジン

2. 特許請求の範囲

2種の燃料タンクと、燃料の選択により各燃料タンクから選択的に燃料を供給する切換弁と、選択された燃料を調圧してエンジンの燃焼室へ燃料を供給する燃料通路と、エンジンの排気系に設けられた全領域空燃比センサと、一方の燃料を基準として他方の燃料の最適値にセッティングしたROMとを有し、前記センサの出力信号により使用燃料による空燃比を制御するようにしたことを特徴とする2種燃料エンジン。

3. 発明の詳細な説明

(産業上の利用分野)

本発明は、2種の燃料を切換えて使用する2種燃料エンジンに関する。

(従来技術)

例えば、LPG(液化石油ガス)とLNG(液化天然ガス)、LPGとH₂、H₂とLNG(またはCNG)のように2種の異なる燃料を切換えて使用するエンジンがある。

このように2種類の燃料を使用する場合、一般に両燃料ともエンジンの負圧により吸入するキャブレタ方式を採用するか、あるいは一方の燃料はインジェクションを用いて制御し、他方の燃料はキャブレタ方式を用いて制御することが多い。

また、両燃料を電子制御する場合は、既存のO₂センサを用いて制御するようにしている。このO₂センサは、試験管状のジルコニア素子の内外面に薄い白金をメッキして電極とし、素子の内外の酸素濃度差に応じて起動力が発生するようにしたものである。

(発明が解決しようとする課題)

しかるに上記の従来技術では、一方の燃料について最適に電子制御しても、他方の燃料はあくまで緊急用としてしかとらえられていないためこれ

を最適空燃比に制御することはなされていず、また O_2 センサを用いたものは、双方の燃料によってエンジンの回転数、負荷に応じた理論空燃比以外の空燃比にフィードバック制御することができなかった。

本発明はこれに鑑み、同一の全領域空燃比センサを用い、エンジンの負荷に応じた空燃比のフィードバック制御および点火時期制御を、各々セッティングされたマップおよび補正係数を使い分けて最適な空燃比制御を可能とする2種燃料エンジンを提供することを目的としてなされたものである。

(課題を解決するための手段)

上記従来技術が有する問題点を解決するため、本発明は、2種の燃料タンクと、燃料の選択により各燃料タンクから選択的に燃料を供給する切換弁と、選択された燃料を調圧してエンジンの燃焼室へ燃料を供給する燃料通路と、エンジンの排気系に設けられた全領域空燃比センサと、一方の燃料を基準として他方の燃料の最適値にセッティン

第2燃料タンク2を有し、これら第1、第2燃料タンク1、2の出口部には、運転席の手動切換スイッチ3 (S_1) により切換え作動され緊急遮断弁を兼ねる切換弁としての第1電磁弁4および第2電磁弁5がそれぞれ設けられている。

これら電磁弁4、5より後流側の燃料通路6はベーパーライザ7を経て前記切換スイッチ3に連動する2方電磁弁8に至り、この2方電磁弁8の一方のポートには第1燃料を整圧するレギュレータ9が接続され、他方のポートには第2燃料を整圧するレギュレータ10が接続されており、これらレギュレータ9、10はそれぞれ逆止弁11、12を介して燃料通路13に接続され、この燃料通路13はエンジン14の燃焼室15に燃料を噴射するインジェクタ16に接続されている。前記各レギュレータ9、10はダイヤフラム式のものが用いられ、その加圧室9a、10aにはエンジン14の吸気通路17の吸気圧が導入通路18、19を通じて導入されるようになっている。

エンジン14の排気通路20には、エンジン

14の回転の全領域において O_2 量を検出することのできる全領域空燃比センサ S_2 が設けられている。このセンサ S_2 は、例えば理論空燃比検出センサとジルコニア素子イオン伝導性を利用した酸素ポンプとの組合せからなっている。

(作用)

手動切換スイッチを切換えて燃料を選択すると、選択された燃料が調圧されて燃料通路を通じエンジンの燃焼室に送られる。このとき全領域での排気中の O_2 量の検出結果に基づき他方の燃料の空燃比に補正がかけられてその燃料の最適空燃比が決定される。したがって全領域の空燃比を測定するので、負荷により適切な空燃比が違ってもそれぞれの燃料に対し適切なマップ制御ができる。

(実施例)

以下、本発明を図面に示す実施例を参照して説明する。

図示の実施例はインジェクション方式のエンジンに適用した場合を示し、燃料としてLPGとLNGの2種の燃料を選択使用する場合を示している。すなわち第1燃料(LPG)と第2燃料(LNG)を別個に収納する第1燃料タンク1と

第2燃料タンク2を有し、これら第1、第2燃料タンク1、2の出口部には、運転席の手動切換スイッチ3 (S_1) により切換え作動され緊急遮断弁を兼ねる切換弁としての第1電磁弁4および第2電磁弁5がそれぞれ設けられている。

第1図において S_3 は燃料通路13に設けられた燃料温度センサ、 S_4 は燃料圧センサであり、また S_5 は吸気通路17に設けられた吸気圧センサ、 S_6 は同じく吸気通路17に設けられた吸気温度センサ、 S_7 は水温センサ、 S_8 はスロットルセンサである。また第2図において21はディストリビュータであり、 S_9 はその気筒判別センサ、 S_{10} はクランク角センサを示し、さらに22はバッテリー、23はイグニッションスイッチを示している。

ECU24は、全領域空燃比センサ S_2 により燃料の違いによる実際の空燃比から他方の燃料の空燃比センサ出力信号に補正をかけるためのROMを有している。この補正は、一方の燃料を基準とし、他方の燃料を補正するようにしている。

いま、運転席の手動切換スイッチ3 (S_1) を切換えて第1または第2燃料のいずれかを選択すると、選択された燃料の燃料タンク1または2の電磁弁4または5が開き、その燃料は燃料通路6、ベーパーライザ7を通してその燃料用のレギュレータ9または10を通り、こゝで整圧されて燃料通路13へ流れ、インジェクタ16からエンジン14の燃焼室15へ噴射される。このときの基本噴射量は、吸気圧センサ S_5 、気筒判別センサ S_9 により定められ、燃料温度センサ S_3 、スロットルセンサ S_8 、水温センサ S_7 、吸気温センサ S_6 、燃料圧センサ S_4 等により補正され、噴射量が決定される。またこれと併せてディストリビュータ21の点火時期の決定がなされる。これらの補正は、全領域空燃比センサ S_2 の検出信号に基づきECU24により行なわれる。

そのフローは、第3図に示すように、全領域空燃比センサ S_2 の出力を読み込み、燃料が第1燃料か否かが判断され、第1燃料であれば、その空燃比を算出し、第2燃料である場合には補正がかけ

られる。ついで吸気圧センサ S_4 、気筒判別センサ S_9 のデータを読み込み、ブースト圧、エンジン回転数に応じ第1燃料、第2燃料それぞれの目標空燃比の選定、点火進角マップ、各種補正が行なわれ、インジェクタ操作量が決定される。

〔発明の効果〕

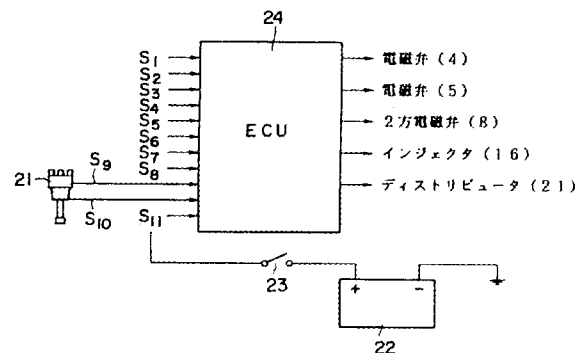
以上説明したように本発明によれば、2種の異なる燃料を選択して用いるエンジンにおいて、全領域空燃比センサを用い、一方の燃料を基準として他方の燃料の空燃比、点火時期等をフィードバック制御するようにしたので、各センサ、アクチュエータ等は同一で各燃料にセッティングしたマップ、補正係数を燃料切換スイッチの信号によって切換使用することが可能となり、簡単なシステムによりそれぞれの燃料の特性に合った空燃比、点火時期を決定することができる。

4. 図面の簡単な説明

第1図は本発明を適用した2種燃料エンジンのシステム図、第2図は同ECUの入出力信号を示

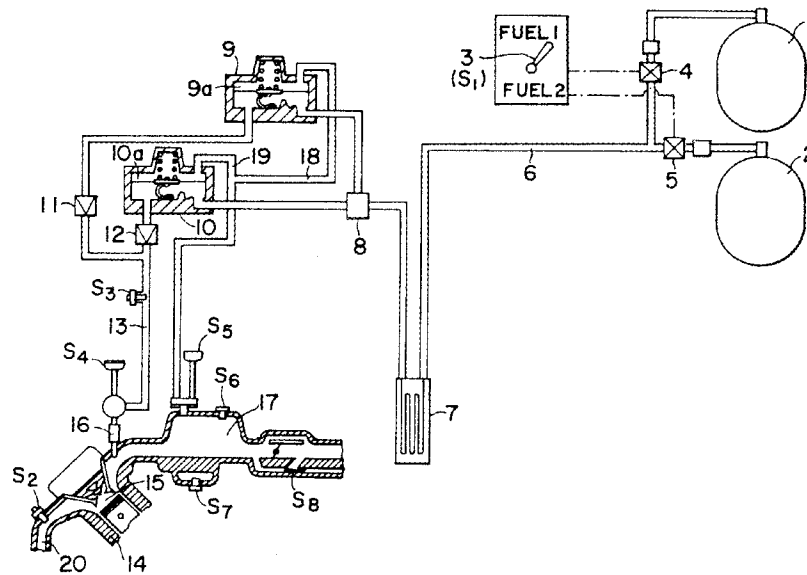
す説明図、第3図は同フローチャートである。

1…第1燃料タンク、2…第2燃料タンク、3 (S_1)…燃料切換スイッチ、4、5…電磁弁、6、13…燃料通路、7…ベーパーライザ、8…2方切換弁、9、10…レギュレータ、14…エンジン、15…燃焼室、16…インジェクタ、17…吸気通路、20…排気通路、21…ディストリビュータ、 S_2 全領域空燃比センサ、 S_3 …燃料温度センサ、 S_4 …燃料圧センサ、 S_5 …吸気圧センサ、 S_6 …吸気温センサ、 S_7 …水温センサ、 S_8 …スロットルセンサ、 S_9 …気筒判別センサ、 S_{10} …クランク角センサ。

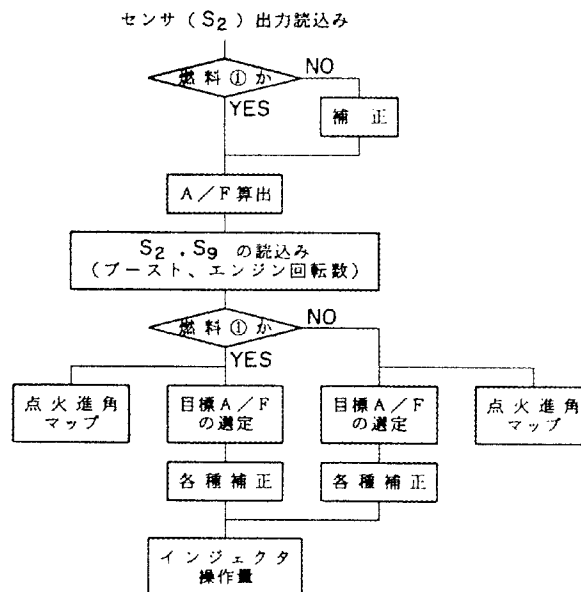


第2図

出願人代理人 佐 藤 一 雄



第 1 図



第 3 図

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16191503
	Filing Date		2018-11-15
	First Named Inventor	Mark J. Sarder et al.	
	Art Unit	3747	
	Examiner Name	Kevin A. Lathers	
	Attorney Docket Number	CET1090.070	

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	4	5555873		1996-09-17	Nolen	
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Art Unit	3747
Examiner Name	Kevin A. Lathers
Attorney Docket Number	CET1090.070

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	3	H0466743	JP	A	1992-03-03	Suzuki Motor Co		
	4	1999001659	WO	A1	1999-01-14	Bailey		
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Examiner Name	Kevin A. Lathers
Attorney Docket Number	CET1090.070

1	Yamaha EF2000iS Tri Fuel Conversion: Overview & Installation Tips, January 3, 2014, https://www.youtube.com/watch?v=caZawwDaRQg
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Art Unit	3747
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Signature	/Andrew C. Stark/	Date (YYYY-MM-DD)	2022-08-11
Name/Print	Andrew C. Stark	Registration Number	65742

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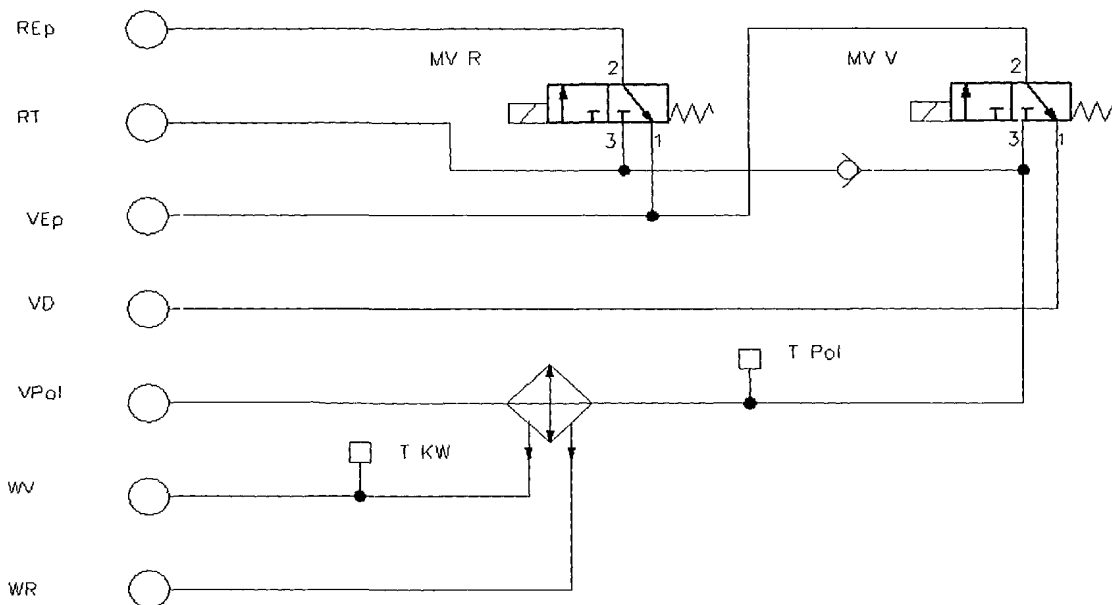
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[Fortsetzung auf der nächsten Seite]

(54) Title: RAPE/DIESEL VALVE

(54) Bezeichnung: RAPS-/DIESELVENTIL



(57) **Abstract:** In an internal combustion engine which is designed for Operation with a plurality of fuels, the entire fuel supply from at least two tanks for fuels having different flow properties is controlled in a Single valve control block. One of the fuels can be used without problems only at higher temperatures than the other one and therefore has to be heated first of all. The valve control block is arranged firstly close to the engine block of the internal combustion engine and secondly in the vicinity of a heat exchanger. As a result of the compact design, the ease of both maintenance and installation of the fuel supply System is improved and the fuel which is to be heated can be heated more rapidly.

[Fortsetzung auf der nächsten Seite]



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(57) Zusammenfassung: In einer für den Betrieb mit mehreren unterschiedlichen Kraftstoffen ausgelegten Brennkraftmaschine wird die gesamte Kraftstoffzufuhr aus mindestens zwei Tanks für Kraftstoffe mit unterschiedlichen Fließeigenschaften in einem einzigen Ventilsteuerblock gesteuert. Einer der Kraftstoffe kann erst bei höheren Temperaturen als der andere problemlos eingesetzt und muss daher zunächst aufgeheizt werden. Der Ventilsteuerblock ist einerseits eng am Motorblock der Brennkraftmaschine und andererseits in der Nähe eines Wärmetauschers angeordnet. Durch den kompakten Aufbau kann sowohl die Wartungs- und Montagefreundlichkeit der Kraftstoffversorgungsanlage verbessert als auch der aufzuheizende Kraftstoff schneller aufgeheizt werden.

Raps-/Dieselventil

Die Erfindung betrifft eine Kraftstoffversorgungsanlage für einen Verbrennungsmotor, der wahlweise mit unterschiedlichen Kraftstoffen betreibbar ist. Kraftstoff 1 ist der vom Hersteller vorgesehene Kraftstoff, beispielsweise Diesel, für den das Fahrzeug konstruiert wurde. Kraftstoff 2 ist ein alternativer Kraftstoff (zumeist Pflanzenöl), der bedingt durch seine physikalischen und chemischen Eigenschaften nur dann problemlos zum Einsatz kommen kann, wenn man bestimmte Betriebszustände mit Kraftstoff 1 abdeckt.

Insbesondere betrifft die Erfindung eine Kraftstoffversorgungsanlage mit einer Ventilvorrichtung zum Umschalten zwischen herkömmlichem Dieselkraftstoff und aus nachwachsenden Rohstoffen erzeugtem Kraftstoff wie Rapsöl oder anderen pflanzlichen Ölen.

Im Stand der Technik sind Vorrichtungen bekannt, um einen Motor mit unterschiedlichen Kraftstoffen, zum Beispiel Diesel und Rapsöl, zu betreiben. Würde ein herkömmlicher Selbstzündermotor nur mit Rapsöl betrieben, träte unter anderem das Problem auf, dass Rapsöl erst bei höheren Temperaturen dünnflüssig genug ist, um in einem solchen Motor in den Brennraum gefördert zu werden. Weiterhin ist das Einspritzsystem herkömmlicher Dieselmotoren nicht für zähflüssigen Kraftstoff konzipiert. Zudem gelangt, wenn der Motor kalt ist, mehr Treibstoff in das Motoröl, weil die Spaltmaße von Kolbenringen noch nicht perfekt passen-. Pflanzenöl verdampft dann aber - im Gegensatz zu Diesel - nicht mehr, so dass das Motoröl beeinträchtigt werden kann. Bei kalten Kolbenaußenwänden ist die Verbrennung schlechter. Es könnten sich bedingt durch Pflanzenöl vermehrt Ablagerungen bilden.

Erst bei einer Kraftstofftemperatur von mindestens ungefähr 60°C sind die Fließ- und Verbrennungseigenschaften von Rapsöl als einem Beispiel für pflanzliche Kraftstoffe mit denen von Diesel vergleichbar. Daher werden herkömmliche Rapsölmotoren beim Starten mit Diesel aus einem ersten Tank betrieben, bis sie warmgelaufen sind. Gleichzeitig wird mit der Abwärme der Motoren über einen Wärmetauscher ein zweiter Tank, der Rapsöl enthält, sowie die Zuführleitungen vom zweiten Tank zum Motor aufgewärmt, beispielsweise indem das Kühlwasser vom Motor den Tank und die Zuführleitungen aufheizt. Sobald die Temperatur des Rapsöls hoch genug ist, beispielsweise bei ungefähr 60°C liegt, wird die Versorgung des Motors mit Diesel gestoppt und der Motor stattdessen mit Rapsöl versorgt. Diese Umschaltung von Diesel auf Rapsöl kann von Hand vorgenommen werden, indem ein entsprechendes Ventil in der Zuführung umgelegt wird. In modernen Anlagen wird die Umschaltung automatisch durchgeführt, sobald der pflanzliche Kraftstoff aufgeheizt ist.

Neben der Fließfähigkeit ändern sich beispielsweise auch die Verbrennungseigenschaften abhängig von der Betriebstemperatur des pflanzlichen Kraftstoffes. Daher reicht es nicht aus, lediglich den Kraftstoff vorzuheizen, sondern der Motor muss zunächst mit dem Kraftstoff auf Betriebstemperatur gebracht werden, für den er ursprünglich ausgelegt wurde. Dann sind alle Bestandteile auf ideale und materialschonende Betriebsbereitschaft gebracht, und das Umschalten kann erfolgen, ohne dem Motor oder anderen Bauteilen Schaden zuzufügen.

In Fahrzeugen mit derartigen für wechselnde Kraftstoffe vorgesehenen Motoren, wie beispielsweise in der DE 38 00585 A1 oder der DE 101 54 455 A1 beschrieben, werden die Kraftstoffe über getrennte Zuleitungen mög-

liehst bis an das Einspritzsystem herangeführt. Dadurch wird eine Vermischung der Kraftstoffe weitgehend vermieden. Lediglich die Einspritzpumpe selbst und eine sehr kurze gemeinsame Zuführung zu der Pumpe muss von beiden Kraftstoffen genutzt werden. Beim Abschalten des Motors wird diese gemeinsame Zuführung wieder mit Dieselkraftstoff gespült bzw. gefüllt, um sicherzustellen, dass beim nächsten Kaltstart kein zähflüssiges Rapsöl in diesem Bereich den Durchfluss von Diesel behindert.

Speziell nach der DE 101 54 455 A1, die als nächstkommender Stand der Technik angesehen wird, gegen die der Anspruch 1 der Erfindung abgegrenzt ist, wird versucht, beide Kraftstoffe möglichst weitgehend in separaten Leitungen bis zu den Einspritzdüsen zu führen. Dies soll so weit gehen, dass für jeden Kraftstoff ein Einspritzsystem inklusive Einspritzdüse pro Zylinder vorgesehen ist, um jederzeit ohne Probleme zwischen den Kraftstoffen umschalten zu können und so das Spülen der Motoren mit Diesel nach dem eigentlichen Abschalten zu unterbinden.

Falls wie üblicherweise nur ein Einspritzsystem pro Zylinder vorhanden ist, werden die Kraftstoffe über getrennte Leitungen zu einem oder mehreren Umschaltventilen zugeführt. Von den Umschaltventilen führt eine (kurze) gemeinsame Leitung zu dem Einspritzsystem je Zylinder, wie oben beschrieben. Daher müssen für jeden Motoraufbau die Ventilanordnung, Kraftstoffleitungen und eventuelle Steuerleitungen für die automatische Umstellung der Ventile angepasst und eingebaut werden; idealerweise werden sogar zwei Einspritzsysteme pro Zylinder vorgesehen. Dies führt zu weitgehender Neukonzeption des Motors oder zumindest zu hohem Umbauaufwand. Zudem ist von Nachteil, dass derartige Systeme in der Regel mit flexiblen Schläuchen aufgebaut sind, die mehrere Zwischenstücke erforder-

lieh machen, die - zumindest bei automatisierter Montage - aufwändig zu montieren und abzudichten sind.

Daher ist es eine Aufgabe der vorliegenden Erfindung, eine Kraftstoffversorgungsanlage zu schaffen, die mindestens zwei verschiedene Kraftstoffe sicher zuführt und hilft, Leckageverluste zu vermeiden. Zudem soll der Montageaufwand deutlich reduziert werden.

Erfindungsgemäß wird diese Aufgabe dadurch gelöst, dass ein Ventilsteuerblock vorgesehen wird, in den Kraftstoffzuleitungen von den Tanks münden und der die Kraftstoffe über weitere Leitungen an die Einspritzdüsen verteilt. Alle Ventile zum Umschalten zwischen den zwei Kraftstoffen, beispielsweise von Diesel- auf Pflanzenölbetrieb, sind in diesen Block integriert.

Dadurch wird die Anzahl der Übergänge und Schlauchanschlüsse für die Kraftstoffe deutlich reduziert, so dass die Leckagegefahr durch Risse in Schläuchen und undichte Übergänge deutlich reduziert ist.

Besonders bevorzugt wird der Ventilsteuerblock mit einer Steuerung kombiniert. Diese Steuerung kann dann die Kraftstoffversorgung automatisch steuern, wie nachstehend noch genauer erläutert wird. Wenn alle Ventile zur Umschaltung zwischen den Kraftstoffen in dem stabilen Ventilsteuerblock integriert sind, kann die Steuerung über mehr oder weniger fest verlegte Leitungen die Ventile ansteuern. Besonders bevorzugt sind auch die wesentlichen Elemente der Steuerung wie eine programmierbare Recheneinheit mit Speichereinheiten mit dem Ventilsteuerblock verbunden. Diese Recheneinheit kann in der Fahrgastzelle angeordnet bzw. mit Ein- und Ausgabeeinheiten in der Fahrgastzelle verbunden sein. Hier können dem Fahrzeugführer eventuell relevante Daten angezeigt werden, beispielsweise, mit welchem Kraftstoff er gerade fährt, die

Kraftstofftemperatur, die bisherige Fahrtdauer mit diesem Kraftstoff usw. Dadurch erhält man eine sehr kompakte und sehr zuverlässige Steuerung, bei der zudem die gesamte Verdrahtung zwischen der Steuereinheit und den Ventilen in einem einzigen Kabelbaum geführt werden kann, was ebenfalls zur Montagefreundlichkeit beiträgt.

Nach einer weiter bevorzugten Ausführungsform wird der Ventilsteuerblock aus wärmeleitendem Material, beispielsweise aus Metall, hergestellt.

Durch den Ventilsteuerblock fließen, wie vorstehend erläutert, beide Kraftstoffe. Wenn der Ventilsteuerblock möglichst nahe am Motor angebracht wird, kann die Abwärme des Motors den Block aufheizen. Wenn dieser die Wärme gut leitet, heizt er folglich auch den darin befindlichen Kraftstoff auf. Dadurch wird das Aufheizen beschleunigt und es kann schneller auf den weniger fließfähigen Kraftstoff umgeschaltet werden. Ferner kann der weniger fließfähige Kraftstoff mit einer geringeren Temperatur bis zum Ventilsteuerblock gefördert werden. Dies ist möglich, weil die Zuleitungen vor dem Ventilsteuerblock größere Querschnitte aufweisen als die Zuleitungen zu den Zylindern und insbesondere in den Einspritzdüsen nach dem Steuerblock, so dass eine Verstopfung weniger wahrscheinlich ist als in den Zuleitungen zu den Zylindern und zudem diese Zuleitungen bereits beim Umrüsten auf den zweiten Kraftstoff entsprechend ausgelegt werden können.

Nach einer weiter bevorzugten Ausführungsform ist der Ventilsteuerblock möglichst nahe bei einem Wärmetauscher angeordnet, der die Aufgabe hat, den weniger fließfähigen Kraftstoff zu erwärmen.

Standardmäßig werden in Motoren zur Verbrennung weniger fließfähiger nachwachsender Rohstoffe Wärmetauscher

eingebaut, die über das Kühlwasser des Motors den Tank mit dem weniger fließfähigen Stoff vorwärmen.

Bei der vorteilhaften Ausführungsform der Erfindung findet dieses Vorwärmen direkt an dem Ventilsteuerblock und daher teilweise auch mit dessen Abwärme statt. Da der Block bereits nach kurzer Betriebszeit aufgewärmt ist, verkürzt sich die Aufwärmzeit für den Kraftstoff weiter und es kann schneller auf den weniger fließfähigen Kraftstoff umgeschaltet werden.

Nach einer weiter bevorzugten Ausführungsform weist die Kraftstoffversorgungsanlage mindestens einen Temperatursensor auf.

Wenn eine Steuerung vorhanden ist, kann diese nach einer vorab festgelegten Zeit des Warmfahrens vom Diesel in den Rapsölbetrieb umschalten. Allerdings muss dann diese Zeit so lange bemessen sein, dass das Rapsöl auch unter ungünstigsten Bedingungen (z.B. im Winter) aufgewärmt ist. Wird dagegen die Temperatur des Kraftstoffes gemessen, kann bei günstigen Bedingungen früher und bei ungünstigen Bedingungen später umgeschaltet werden, so dass möglichst wenig Dieselkraftstoff benötigt wird. Darüber hinaus wird die Temperatur des zweiten Kraftstoffs dann ideal ermittelt, wenn sie nicht direkt im Tank, sondern erst in den Zuführleitungen, möglichst kurz vor dem Ventilsteuerblock, geprüft wird. Sobald die Prüfung ergibt, dass die Kraftstoff- (und ebenso die Motor-) Temperatur die gewünschte Temperatur erreicht hat, kann umgeschaltet werden. Dadurch reduziert man (in Verbindung mit den anderen genannten Maßnahmen wie kurzen Wegen etc. die Betriebszeit mit dem ersten Kraftstoff. Dies trägt zur schnelleren Amortisation der Anlage bei. Ist dagegen keine automatische Steuerung vorhanden, kann dem Fahrer über

den Temperatursensor signalisiert werden, dass ein Umschalten möglich ist.

Noch weiter bevorzugt kann die Kraftstoffanlage automatisch in zwei Modi, nämlich einem Modus mit geschlossenem und einem Modus mit offenem Kreislauf mit Pflanzenöl betrieben werden.

Grundsätzlich werden Benzin- und Dieselmotoren herkömmlich in einem offenen Kreislauf betrieben, das heißt, Kraftstoff wird aus dem (drucklosen) Tank von einer Pumpe unter einem geringen Druck in einen Umlauf gefördert, aus dem der benötigte Kraftstoff entnommen wird. Der nicht benötigte Kraftstoff fließt wieder in den Tank zurück und führt dabei zusätzlich etwas Wärme aus dem Motor ab. Rapsölmotoren, die auf eine gute Erwärmung des Kraftstoffes angewiesen sind, werden dagegen herkömmlich in einem geschlossenen Kreislauf betrieben. Dabei zirkuliert das Pflanzenöl in einer Leitung im Motor, und nur das verbrauchte Öl wird von der Kraftstoffpumpe in diesen Kreislauf zugeführt. Dadurch erwärmt sich das Öl im Kreislauf sicher auf die benötigte Temperatur; das Pflanzenöl im Tank wird dagegen nur durch den Wärmetauscher erwärmt. Allerdings besteht bei dem geschlossenen Kreislauf die Gefahr, dass an undichten Stellen Luft in den Kreislauf gelangt, was zu Zündaussetzern und schließlich zum Liegenbleiben des Fahrzeugs führt. Durch Spülen des Kreislaufes muss in einem solchen Fall die Luft ersetzt werden.

Erfindungsgemäß wird der Motor beim Umschalten in den Pflanzenölbetrieb ebenfalls zunächst im geschlossenen Kreislauf betrieben. Aufgrund der vorstehend beschriebenen Effekte bezüglich Wärmeleitung, Kompaktheit und Integration wird jedoch erfindungsgemäß der Kraftstoff besser als im Stand der Technik erwärmt. Zudem wird die Tem-

peratur des Kraftstoffs im Umlauf gemessen. Daher kann automatisch auf den offenen Umlauf umgeschaltet werden, wenn die Pflanzenöltemperatur ausreichend hoch, d.h. um einen Sicherheitsfaktor höher als der Wert für die Fahrt mit Öl im geschlossenen Umlauf ist. Dadurch wird das Öl im Tank erwärmt, und der (ebenfalls Leistung benötigende) Wärmetauscher kann eventuell abgestellt werden. Fällt die Öltemperatur durch diese Maßnahmen zu stark, wird (automatisch) im geschlossenen Kreislauf weitergefahren. Durch die Fahrt im offenen Kreislauf wird zuverlässig Luft aus dem System entfernt, so dass die Zuverlässigkeit höher wird.

Nach einer weiter bevorzugten Ausführungsform weist die Kraftstoffversorgungsanlage starre Kraftstoffleitungen zwischen dem Ventilsteuerblock und der Brennkraftmaschine auf, die noch weiter bevorzugt eng am Zylinderblock anliegend angeordnet sind.

Während im Stand der Technik kurze, flexible Leitungen zwischen den einzelnen Ventilen und den Zylindern sowie lange, flexible Leitungen von den Tanks zu den Zylindern verwendet werden, wird nach dieser bevorzugten Ausführungsform der Erfindung mit festen Rohren gearbeitet, die idealerweise am Motorblock oder am Zylinderkopf anliegen. Die festen, beispielsweise aus Metall gefertigten Rohre können die Wärme des Motors gut aufnehmen. Zudem sind sie eng am Motor anliegend gegen Fahrtwind und andere kühlende Einflüsse geschützt. Dadurch wird der Kraftstoff in den Rohren schnell erwärmt. Dies wurde im Stand der Technik bisher aus zwei Gründen nicht verwirklicht: Zum einen werden herkömmlich flexible Kunststoffschläuche verwendet, um bei einer Nachrüstung von Hand mehrere ähnliche Motoren umrüsten zu können, wobei die Automatisierbarkeit keine Rolle spielt, dafür aber mit ähnlichen Bauteilen unterschiedliche Abstände zwischen

Teilen des Einspritzsystems realisiert werden können, und zum zweiten ist vor allem von Ottomotoren bekannt, dass der in zu heißen Zuleitungen befindliche Kraftstoff Gasblasen bildet, die die Versorgung des Motors behindern können. Diese Gefahr besteht jedoch bei den hier bevorzugt verwendeten Kraftstoffen Rapsöl und Diesel nicht, so dass eine effektive Aufheizung des Kraftstoffs möglich ist. Die festen Rohre sind bei automatisierter Montage, beispielsweise bei einem serienmäßigen Einbau, deutlich einfacher handhabbar und praktisch wartungsfrei, da die bei Schläuchen möglichen Leckstellen weitgehend vermieden werden.

Wie vorstehend beschrieben, arbeitet die erfindungsgemäße Kraftstoffversorgungsanlage idealerweise gemeinsam mit einer Steuervorrichtung.

Nach einer bevorzugten Ausführungsform übernimmt die Steuervorrichtung der Kraftstoffanlage den kompletten Betrieb zum Umschalten von einem Kraftstoff auf den anderen. Insbesondere veranlasst die Steuervorrichtung, dass die Kraftstoffleitungen beim Abstellen des Motors nach Betrieb mit dem weniger fließfähigen Kraftstoff mit dem fließfähigen Kraftstoff gespült werden, um sicherzustellen, dass der Motor beim darauffolgenden Kaltstart problemlos starten kann.

Nach einer weiter bevorzugten Ausführungsform kann das Spülen wie im Stand der Technik durch den Fahrer ausgelöst werden, der einen Wahlschalter in der Fahrerkabine betätigt.

Wenn der Fahrer beabsichtigt, demnächst eine längere Rast einzulegen, bei der der Motor abkühlt, kann er die Spülung rechtzeitig selbst auslösen. Dann können die Zuleitungen noch während der Fahrt gespült werden, so dass

keine Nachlaufzeit des Motors zu diesem Zweck nötig ist. Dazu kann dem Fahrer ein einbauspezifischer Wert, wie lange Diesel durchgespült werden muss, mitgeteilt werden. Stellt der Fahrer das Fahrzeug ohne vorheriges (oder nach nicht ausreichendem) Spülen ab, sorgt die Steuerung dafür, dass der Motor weiterläuft, bis das System gespült ist und problemlos wieder starten kann.

Umgekehrt kann es auch zweckmäßig sein, wenn der Fahrer veranlassen kann, dass das Spülen beim Abstellen des Motors unterdrückt wird, wenn nur eine kurze Pause zu erwarten ist, beispielsweise an einem geschlossenen Bahnübergang. Daher kann der Fahrer nach einer weiter bevorzugten Ausführungsform der Kraftstoffversorgungsanlage über einen Wahlschalter das Spülen (zunächst) umgehen.

Nach einer noch weiter bevorzugten Ausführungsform überwacht dabei die Steuerung die Kraftstofftemperatur und führt das Spülen trotz der Unterdrückung selbständig durch, falls die Temperatur unter einen bestimmten Wert fällt, d.h. die Gefahr besteht, dass sich die Fließfähigkeit verschlechtert, so dass der Motor nicht mehr gestartet werden kann.

Vorteilhafte Weiterbildungen finden sich in weiteren Unteransprüchen.

Die Erfindung wird nachfolgend anhand eines Ausführungsbeispiels unter Bezugnahme auf die Zeichnung näher erläutert.

Fig. 1 zeigt einen Hydraulikschaltplan für das Ausführungsbeispiel der Erfindung.

Fig. 2 zeigt ein Ablaufdiagramm einer bevorzugten Ausführungsform der erfindungsgemäßen Steuerung.

Die Figuren 3 bis 9 zeigen Ablaufpläne von Unterprogrammen des Hauptprogramms nach Fig. 2.

Als Ausführungsbeispiel wird, wie vorstehend erwähnt, ein Fahrzeug mit Dieselmotor verwendet, das zum Betrieb mit Rapsöl als Alternativkraftstoff umgerüstet wurde.

Beim Start des Fahrzeugs sind beide Ventile zunächst stromlos. Dadurch fließt Diesel vom Tankanschluss VD des Ventilsteuerblocks über die Anschlüsse 1 und 3 des MV V und den Anschluss VEp des Ventilsteuerblocks in Richtung des Einspritzsystems bzw. der Einspritzpumpe. Wie im Stand der Technik wird der Einspritzpumpe über diesen Vorlauf eine größere Menge an Diesel angeboten, als sie benötigt. Der überschüssige Dieselmotor fließt aus dem Rücklauf des Einspritzsystems sowie die Anschlüsse 2 und 1 des MV R im sogenannten „geschlossenen Kreislauf“ über den Anschluss REp des Ventilsteuerblocks.

Wenn der Motor betriebswarm ist, wird das MV V umgeschaltet (bestromt). Dadurch wird die Zufuhr von Dieselmotor gestoppt und die Zufuhr von Rapsöl im „geschlossenen Kreislauf“ (über die Anschlüsse 3 und 2 des MV V zu VEp, von dort zurück über REp und die Anschlüsse 2 und 1 des MV R) gestartet. Da das Rapsöl zu diesem Zeitpunkt in vorgewärmten Leitungen auf bereits warmen Dieselmotor trifft, den es nach und nach ersetzt, erwärmt sich auch die vergleichsweise kleine Menge an Rapsöl bei stromlosem MV R im Vor- und Rücklauf des Einspritzsystems schnell in ausreichendem Maße. Das nicht verbrauchte Rapsöl zirkuliert weiter und kann daher das nachgeführte Rapsöl, das das verbrannte Öl ersetzt, ebenfalls erwärmen. Damit steht während der Fahrt stets ausreichend warmes Rapsöl zur Verfügung.

Erhöht sich die Temperatur des Rapsöls im Ventilsteuerblock während der Fahrt weiter, kann das MV R umgeschaltet (bestromt) werden. Dann fließt das von dem Einspritzsystem nicht verbrauchte Rapsöl im „offenen Kreislauf“ über die Anschlüsse 2 und 3 des MV R zurück in den Rapsöltank. Dadurch wird das im Tank befindliche Rapsöl schneller aufgeheizt als bei der alleinigen Heizung durch den Wärmetauscher. Zudem können Luftansammlungen, die durch Undichtigkeiten im vorstehend erörterten geschlossenen Kreislauf dazu führen können, dass Luft in den Zulauf zum Einspritzsystem gelangt, im offenen Kreislauf in den Tank zurückgegeben werden. Geschieht dies nicht, könnte es bei zu großen Luftblasen aufgrund einer Undichtigkeit im geschlossenen Kreislauf geschehen, dass das Einspritzsystem Luft statt Kraftstoff ansaugt und das Fahrzeug deshalb liegenbleibt.

Wenn erkannt wird, dass die Kraftstoffanlage gespült werden muss (weil der Fahrer den Motor abstellt oder einen entsprechenden Schalter der Steuerung betätigt, um anzuzeigen, dass der Motor demnächst abgestellt wird), wird das MV V stromlos geschaltet und Diesel fließt wie vorstehend beschrieben vom Anschluss 1 des MV V über den Anschluss 2 in den Umlauf zur Einspritzpumpe (Anschlüsse VEp und REp), um diesen zu spülen. Über die Anschlüsse 2 und 3 des noch bestromten MV R wird zudem der Rücklauf zum Rapstank (RT) mit Diesel gespült.

Das vorstehend erläuterte Grundprinzip kann je nach Auslegung des Motors modifiziert werden. Beispielsweise ist es möglich, das Rapsöl durch eine (nicht gezeigte) elektrische Hilfspumpe zirkulieren zu lassen, bevor das Fahrzeug startet, beispielsweise um es mittels einer (ebenfalls nicht gezeigten) Heizwendel aufzuwärmen. In diesem Fall wird das Rapsöl vom Anschluss VPöl durch den Ventilsteuerblock über das gezeigte Rückschlagventil zum

Anschluss RT gepumpt, ohne in den Umlauf des Einspritz - Systems zu gelangen, während der Umlauf mit Diesel ge- spült wird (beide MV stromlos) .

Falls eine solche Maßnahme bei einem gegebenen Motor nicht notwendig erscheint (weil z.Bsp. der zweite Kraft- stoff im Steuerblock ausreichend erwärmt wird) , kann die Leitung über das Rückschlagventil deaktiviert bleiben bzw. einfach weggelassen werden.

Im folgenden werden mögliche Steuerungsprogramme für den vorstehend erläuterten Ventilsteuerblock anhand der Figuren 2 bis 7 erörtert.

Figur 2 zeigt den allgemeinen Ablauf der Motorüberwa- chung. Sobald der Fahrschalter eingeschaltet ist (S200) , wird zunächst (S300) geprüft, ob alle Bauteile der Kraft- stoffversorgung normal arbeiten. Falls nicht, wird dem Fahrer im Schritt S400 eine Fehlfunktion gemeldet, bei- spielsweise über ein Display, eine Warnlampe und/oder ein akustisches Signal und das Programm geht wieder an den Anfang zurück .

Falls zunächst keine Fehlfunktion festgestellt wird, wird in Schritt S500 ein (nicht gezeigtes) Programm zur Drehzahlüberwachung gestartet. Dieses Programm prüft wäh- rend einer vorab festgelegten Zeit, ob die Motordrehzahl über einen festgelegten Wert steigt, d.h. ob der Motor innerhalb dieser Zeit gestartet wird. Falls nicht, geht die Steuerung zum Schritt S400, um einen Fehler zu mel- den, und anschließend wieder wie vorstehend beschrieben zurück .

Anschließend wird der Motor im Schritt S600 auf her- kömmliche Weise gestartet. Wie aus der nachfolgenden Be- schreibung der Steuerung, insbesondere der Fig. 9, noch

klar wird, startet der Motor stets mit Dieselkraftstoff, d.h. beide Magnetventile sind ausgeschaltet.

Nach dem erfolgreichen Starten des Motors geht die Steuerung im Schritt S700 zum in Figur 3 gezeigten Unterprogramm zum Umschalten zwischen Kurzstrecken- und Automatikbetrieb. Dabei prüft das Programm, ob der Fahrer eine Taste „P/D“ („Pflanzenöl/Diesel“) der Steuerung gedrückt hat, um die Steuerung vom automatischen Umschalten auf Pflanzenöl abzuhalten, weil beispielsweise nur eine kurze Strecke zu fahren ist. Ist die Taste nicht gedrückt, geht das Programm zurück und fährt in der derzeitigen Betriebsart fort. Ist die Taste gedrückt, wird die Betriebsart in den Schritten S720 bis S740 in die jeweils andere Betriebsart umgeschaltet.

Ist im Schritt S710 beispielsweise die P/D-Taste gedrückt und wird im S720 festgestellt, dass die Steuerung im Automatikbetrieb ist, schaltet die Steuerung in den Kurzstreckenbetrieb. Dieses Umschalten wird anhand der Fig. 4 näher erläutert.

Im Schritt S731 der Fig. 4 werden beide Magnetventile MV v, MV R des Ventilsteuerblocks stromlos geschaltet. Wie vorstehend erläutert, wird der Motor daher ausschließlich mit Dieselkraftstoff versorgt. Im Schritt S732 wird geprüft, ob ein Umschalten auf Pflanzenölbetrieb möglich ist. Dazu wird (hier nicht gezeigt) der beim Automatikbetrieb erläuterte Programmschritt S742 durchgeführt. Wenn dieser Schritt ergibt, dass ein Betrieb mit Pflanzenöl möglich ist, wird im Schritt S732 jedoch nicht unmittelbar in den Pflanzenölbetrieb umgeschaltet, sondern lediglich der Fahrer beispielsweise optisch oder akustisch daran erinnert, dass ein solcher Betrieb möglich ist. Der Fahrer kann dann durch Drücken der „P/D“-Taste in den Automatikbetrieb umschalten, wie mit

Bezug auf Fig. 3 beschrieben. Im Schritt S733 geht die Steuerung zurück zum „Umschalt“-Programm.

Wird bei gedrückter P/D-Taste im Schritt S720 festgestellt, dass die Steuerung im Kurzstreckenbetrieb ist, schaltet die Steuerung in den Automatikbetrieb. Dieses Umschalten wird anhand der Fig. 5 näher erläutert.

In Fig. 5 wird im Schritt S7410 zunächst geprüft, ob die Bedingungen für Nebenantrieb oder Nurdieselsbetrieb vorliegen. Diese Bedingungen liegen vor, wenn entweder ein ungünstiges Drehzahl-/Drehmomentverhältnis vorliegt („Nebenantrieb“) oder beide Tanks mit Diesel gefüllt sind („Nurdieselantrieb“).

Es ist bei einem Dieselmotor zu bevorzugen, den Motor auch dann nicht im gesamten Leistungsbereich mit Pflanzenöl zu betreiben, wenn er warmgefahren ist, da sich die Verbrennungstemperaturen und damit die Verbrennungseigenschaften des Pflanzenöls ändern. Daher ist die Steuerung so angepasst, dass der Motor nur in einem für die Verbrennung von Pflanzenöl optimalen Bereich mit dem Öl betrieben wird, während er ansonsten mit Diesel betrieben wird. Beispielsweise liegt bei einem Motor zur Verbrennung von Diesel und Pflanzenöl dieser optimale Bereich der sauberen Verbrennung, besten Kompression und optimalen Haltbarkeit bei 40 bis 85 Prozent der Nennlast. Wird der Motor dagegen (im Stau oder ausschließlich zum Betrieb von Nebenaggregaten) mit minimaler Last oder (z.B. an Steigungen) mit hoher Last betrieben, ist es von Vorteil, in diesen Betriebszuständen ausschließlich mit Diesel zu fahren.

Daher prüft die Steuerung im Unterprogramm „Nebenantrieb“ zunächst (Schritt S711), ob die Drehzahl oder das Drehmoment in dem vorstehend genannten für den Pflan-

zenöleinsatz ungünstigen Bereich liegen. Dies kann durch direkten Abgriff der Daten aus dem Motormanagement erfolgen. Falls nicht, geht die Steuerung zum Schritt S7410 (Fig. 5) zurück. Liegen Drehzahl und/oder Drehmoment im genannten ungünstigen Bereich, werden im Schritt S772 beide Magnetventile ausgeschaltet. Dadurch wird der Motor mit Dieselkraftstoff versorgt. Ferner wird im Schritt S773 geprüft, ob ausreichend Pflanzenöl im Tank ist. Falls ja, wälzt die Pflanzenölpumpe das Öl um (Schritt S774), damit es warm bleibt bzw. wird, bis die ungünstigen Verbrennungsbedingungen nicht mehr vorliegen. Wenn nicht (Schritt S775), wird die Pflanzenölpumpe abgeschaltet. Anschließend kehrt das Programm zum Schritt S7410 zurück.

Ferner kann es sein, dass bei geringem Angebot an Pflanzenöl, beispielsweise bei Fahrten ins Ausland mit geringerer Dichte an Pflanzenöltankstellen oder schlicht anderen (steuerlichen) Gegebenheiten im Ausland nur mit Diesel gefahren werden soll. Für diesen Fall kann auch der (vergleichsweise große) für Pflanzenöl ausgelegte Tank mit Dieselkraftstoff befüllt werden. Diese Dieselbefüllung wird der Steuerung mitgeteilt, beispielsweise über einen Schalter am Pflanzenöltank.

Falls die beiden Tanks mit Diesel gefüllt sind, geht die Steuerung über die Schritte S7410, S7420 zum nachstehend mit Bezug auf Fig. 8 beschriebenen Nurdieselbetrieb (Schritt S780). Dieser unterscheidet sich vom „Nebenbetrieb“ dadurch, dass der Dieselkraftstoff aus dem für Pflanzenöl vorgesehenen Tank zugeführt wird. Daher kann auf die Vorwärmung für den Pflanzenöltank verzichtet werden. Zunächst wird geprüft, ob der Motor abgeschaltet ist.

Ist jedoch sowohl Pflanzenöl im Tank als auch eine für den Pflanzenölbetrieb geeignete Motorlast (Dreh-

zahl/Drehmoment) vorhanden, geht die Steuerung zum Schritt S741 weiter, in dem zunächst beide Ventile MV V, MV R des Ventilsteuerblocks stromlos geschaltet sind, so dass der Motor mit Diesel läuft. Im Schritt S742 wird dann geprüft, ob die Kühlwasser temperatur KW eine Umschalttemperatur Ums, beispielsweise 60°C (zuzüglich eines eventuellen Sicherheitszuschlags Ws, beispielsweise 5°C) überschritten hat, mit anderen Worten, ob der Motor bereits warmgefahren ist. So lange die Kühlwassertemperatur zu niedrig ist, wird diese Abfrage wiederholt, d.h. das Programm geht zum Schritt S7410 zurück. Steigt die Kühlwassertemperatur über den genannten Wert, so wird im Schritt S743 das MV V eingeschaltet, d.h. Pflanzenöl wird in den Kreislauf der Einspritzpumpe zugeführt und verdrängt allmählich den zugeführten Dieselkraftstoff, wobei es weiter erwärmt wird. Im Schritt S744 prüft die Steuerung, ob eine vorab festgelegte Zeit VentzeitRü verstrichen ist, nach der nur Pflanzenöl im Einspritzsystem sein sollte. Wenn diese Zeit noch nicht verstrichen ist (JA im Schritt S744) geht das Programm zum Schritt S742 zurück, um zu prüfen, ob die Temperatur des Pflanzenöls ausreichend hoch bleibt. Bleibt die Temperatur hoch genug, bis VentzeitRü abgelaufen ist, („NEIN“ im Schritt S744) geht das Programm zum Schritt S7450 und somit zum Unterprogramm „Reiner Pflanzenölbetrieb“ weiter, das in Fig. 6 erläutert ist.

Im Schritt S7451 in Fig. 6 wird das MV R eingeschaltet, so dass nun Rapsöl im Zulauf der Einspritzpumpe zirkuliert. Im Schritt S7452 wird geprüft, ob die Temperatur an der Einspritzpumpe größer als eine Temperatur TRückauto zum automatischen Rückschalten in den Dieselbetrieb ist. Dies kann beispielsweise der Fall sein, wenn bei niedriger Last und hoher Wärmeabfuhr die Temperatur der Einspritzpumpe sinkt. Bei einem positiven Ergebnis dieser Abfrage wird in den in Fig. 7 beschriebenen Nebenantrieb

(Schritt S770) geschaltet, d.h. der Motor wird wie bei geringer Auslastung ausschließlich mit Diesel betrieben. Bleibt die Temperatur der Einspritzpumpe hoch genug, wird im Schritt S7453 geprüft, ob die P/D-Umschalttaste gedrückt ist, d.h., ob auf Wunsch des Fahrers in den Dieselmotorbetrieb umgeschaltet werden soll. Der Fahrer kann dies beispielsweise wünschen, um ein späteres Spülen zu vermeiden. Ist die Taste gedrückt, geht das Programm zum Schritt S730 (Fig. 4); ansonsten geht es im S7454 zum Automatikbetrieb nach Fig. 5 zurück.

In Fig. 5 prüft das Programm dann im Schritt S746, ob der Motor auf Wunsch des Fahrers auszuschalten ist. Wenn nicht, geht das Programm zum Schritt S7450 zurück und wiederholt den Ablauf für den reinen Pflanzenölbetrieb.

Soll der Motor ausgeschaltet werden, geht das Programm im Schritt S7460 der Fig. 5 zum in Fig. 9 gezeigten Unterprogramm. In diesem Programm wird zunächst im Schritt S7461 geprüft, ob der Motor bereits ausreichend lange (ca. 1 min) im Dieselmotorbetrieb arbeitet. Wenn ja, wird der Motor abgestellt (Schritt S7466) und das Programm beendet.

Wenn der Motor noch nicht lange genug mit Diesel betrieben wird, werden zunächst (Schritte S7462, S7463) die Pflanzenöl-Umlaufpumpe und die Magnetventile abgeschaltet, so dass dem Einspritzsystem nur noch Dieselmotorstoff zugeführt wird. Anschließend wird das Einspritzsystem für ca. eine Minute mit Dieselmotorstoff gespült (Schritt S7464), so dass kein Pflanzenöl im Einspritzsystem mehr vorhanden ist, und anschließend der Motor abgestellt (Schritt S7464). Danach (Schritt S7467) wird geprüft, ob die „Kurzstop“-Taste gedrückt wurde, d.h. der Fahrer beabsichtigt, in Kürze mit warmem Motor weiterzufahren. Falls ja, startet der Motor im Automatikbetrieb

neu, d.h. , wenn die Voraussetzungen (Wärme, Belastung etc.) erfüllt sind, wird wieder in den reinen Pflanzenölbetrieb geschaltet. Wenn dagegen die „Kurzstop“-Taste nicht gedrückt wurde, wird das Programm beendet, d.h. der Motor startet beim nächsten Anfahren in dem herkömmlichen Steuermodus .

Weiterhin kann die Steuerung so ausgelegt sein, dass sie die Kraftstoffversorgung auf den vom Hersteller vorgesehenen Kraftstoff, beispielsweise Diesel, umschaltet, wenn die Motorlast für eine vorab bestimmte Zeit unterhalb einer vorab bestimmten Last bleibt (und/oder umgekehrt auch so, dass umgeschaltet wird, wenn die Motorlast für eine vorab bestimmte Zeit eine maximale Last überschreitet) . Statt der Motorlast, die man aus Daten eines Motormanagements erhalten kann, ist es bei einer einfacheren Ausführungsform auch möglich, ausgehend von der Motordrehzahl umzuschalten. Ein Diesel fährt am besten mit einer konstanten Last von 40-85 %, dabei hält er mit Abstand am längsten, weist die besten Verbrennungswerte, eine saubere Kompression usw. auf. Bei einer geringen Motordrehzahl, wenn beispielsweise nur Nebenaggregate des Fahrzeugs wie Klimaanlage, Silopumpen, Betonmischer, hydraulische Anlagen usw. betrieben werden, können sich verstärkt Ablagerungen durch unvollständige Verbrennung bilden. Dies kann vermieden oder zumindest stark reduziert werden, wenn unter solchen Umständen auf den vom Hersteller vorgesehenen Kraftstoff umgeschaltet wird. Fig. 7 zeigt ein Beispiel eines Unterprogramms zu diesem Zweck. Zunächst wird von der Steuerung entweder über zusätzliche Sensoren oder über direkten Zugriff auf Motormanagementdaten festgestellt, ob die Motorlast in einem ungünstigen Bereich liegt, d.h. Drehzahl und/oder Drehmoment außerhalb des o.g. Bereichs liegen (Schritt S771) . Falls ja, werden beide Magnetventile abgeschaltet (Schritt S772) . Anschließend wird geprüft, ob mindestens

eine bestimmte Menge, beispielsweise rund 10 Prozent einer Tankfüllung an Pflanzenöl im Tank ist (Schritt S773) . Falls ja, wird das Öl umgewälzt, um es mit der Abwärme des Motors aufzuwärmen (Schritt S11A) . Ist die Ölmenge jedoch gering, wird die Pumpe abgeschaltet, um nicht eventuelle Verunreinigungen am Boden des Tanks aufzuwirbeln und zu fördern (Schritt S775) . Anschließend kehrt das Programm zum Hauptprogramm zurück .

Natürlich ist der vorstehend beschriebene Aufbau nicht auf das Umschalten von Raps- oder anderem Pflanzenöl auf Diesel beschränkt, sondern kann bei entsprechender Anpassung für alle denkbaren Kraftstoffpaarungen eines Zweistoffmotors verwendet werden. Beispiele für weitere Kraftstoffpaarungen sind Benzin / Ethanol, Benzin / Flüssiggas, Benzin / Flüssigwasserstoff oder Flüssigwasserstoff / Flüssiggas. Obwohl bei diesen Paarungen die Probleme unterschiedlich von den hier beschriebenen sind (so muss beispielsweise wahrscheinlich nicht bei jeder dieser Paarungen gespült werden) , kann das gezeigte Konzept eines Ventilsteuerblocks, in den alle zum Umschalten nötigen Ventile integriert sind und der von einer Steuereinheit angesteuert wird, vorteilhaft für verschiedene Kraftstoffpaarungen verwendet werden.

Ansprüche

1. Kraftstoffversorgungsanlage zur Versorgung einer
5 Brennkraftmaschine über verschiedene Kraftstoffleitungen
mit wahlweise einem Kraftstoff A oder einem Kraftstoff B,
mit einer steuerbaren Ventilanordnung zur Umschaltung
zwischen den Kraftstoffen,
gekennzeichnet durch
10 einen Ventilsteuerblock, in den die Ventilanordnung
integriert ist.

2. Kraftstoffversorgungsanlage nach Anspruch 1, dadurch
gekennzeichnet, dass der Ventilsteuerblock aus einem wärme-
15 leitenden Material hergestellt ist.

3. Kraftstoffversorgungsanlage nach einem der vorher-
gehenden Ansprüche, dadurch gekennzeichnet, dass der Ven-
tilsteuerblock benachbart zu einem Wärmetauscher zum Auf-
20 heizen eines der Kraftstoffe angeordnet ist.

4. Kraftstoffversorgungsanlage nach einem der vorher-
gehenden Ansprüche, gekennzeichnet durch eine Steuerein-
richtung, welche die Kraftstoffversorgung durch Ansteuern
25 des Ventilsteuerblocks steuert.

5. Kraftstoffversorgungsanlage nach Anspruch 4, dadurch
gekennzeichnet, dass die Steuervorrichtung zumindest eine
30 Ein-/Ausgabeeinheit aufweist, die in der Fahrgaszelle an-
geordnet ist.

6. Kraftstoffversorgungsanlage nach Anspruch 4 oder 5,
dadurch gekennzeichnet, dass die Steuervorrichtung veran-
35 lasst, dass mindestens eine der Kraftstoffzuleitungen vor
einem endgültigen Abstellen der Brennkraftmaschine mit dem
anderen Kraftstoff gespült werden.

7. KraftstoffVersorgungsanlage nach Anspruch 6, dadurch gekennzeichnet, dass eine Spülung auch durch Drücken eines Wahlschalters in der Fahrerkabine auslösbar ist.

5

8. KraftstoffVersorgungsanlage nach Anspruch 6 oder 7, dadurch gekennzeichnet, dass das Spülen durch Drücken eines Wahlschalters in der Fahrerkabine unterdrückbar ist.

10 9. KraftStoffVersorgungsanlage nach Anspruch 8, dadurch gekennzeichnet, dass die Unterdrückung des Spülen automatisch aufgehoben und das Spülen durchgeführt wird, wenn ein Sensor meldet, dass die Temperatur eines der Kraftstoffe unter einen vorab festgelegten Wert gefallen ist.

15

10. Brennkraftmaschine mit einer Kraftstoffversorgungsanlage nach einem der vorhergehenden Ansprüche, gekennzeichnet durch mindestens einen Temperatursensor zum Feststellen der Temperatur mindestens eines Mediums, das eine Aussage
20 über den Betriebszustand der Brennkraftmaschine zulässt.

11. Brennkraftmaschine mit einer Kraftstoffversorgungsanlage nach einem der vorhergehenden Ansprüche, gekennzeichnet durch starre Kraftstoffleitungen zwischen dem Ventilststeuerblock und der Brennkraftmaschine.
25

12. Brennkraftmaschine mit einer Kraftstoffversorgungsanlage nach Anspruch 11, dadurch gekennzeichnet, dass die Kraftstoffleitungen zumindest für einen der Kraftstoffe eng
30 an einem Motorblock und/oder Zylinderkopf der Brennkraftmaschine entlang geführt werden

13. Steuervorrichtung für eine Kraftstoffversorgungsanlage nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, dass die Steuervorrichtung die Kraftstoffversorgungsanlage abhängig von der Last des Motors steuert.
35

14. Steuervorrichtung nach Anspruch 13, dadurch gekennzeichnet, dass die Steuervorrichtung die Last des Motors abschätzt und veranlasst, dass die Kraftstoffversorgung umschaltet, wenn die Last des Motors für eine vorab bestimmte
5 Zeit unterhalb einer vorab bestimmten Last liegt.

15. Steuervorrichtung nach Anspruch 13, dadurch gekennzeichnet, dass sie die Last des Motors aufgrund von Motor-
managementdaten ermittelt und die Kraftstoffversorgungsan-
10 läge aufgrund der ermittelten Werte umschaltet.

16. Steuervorrichtung nach einem der Ansprüche 13 bis 15, dadurch gekennzeichnet, dass sie die Kraftstoffversor-
gungsanlage umschaltet, wenn nur Nebenaggregate laufen.
15

17. Steuervorrichtung nach einem der Ansprüche 13 bis 16, dadurch gekennzeichnet, dass sie durch Öffnen eines in der Ventilanordnung angeordneten Rücklaufventils (MV R) veran-
lasst, dass im Betrieb mit Kraftstoff B von der Einspritz-
20 pumpe nicht verbrauchter Kraftstoff in den entsprechenden Tank zurückgeführt wird.

18. Steuervorrichtung nach einem der Ansprüche 13 bis 17, dadurch gekennzeichnet, dass sie einem Bediener eine Mög-
25 lichkeit bietet, manuell auf Kraftstoff A umzuschalten bzw. die Umschaltung auf Kraftstoff B manuell zu verhindern.

19. Steuervorrichtung nach Anspruch 18, gekennzeichnet durch eine Vorrichtung, um den Bediener daran zu erinnern,
30 dass mit Kraftstoff B gefahren werden könnte, wenn die dafür erforderlichen Bedingungen vorliegen, der Bediener die Umschaltung auf Kraftstoff B jedoch manuell verhindert hat.

20. Steuervorrichtung nach einem der Ansprüche 13 bis 19, dadurch gekennzeichnet, dass sie zunächst ein in der Ven-
35 tilanordnung angeordnetes Vorlaufventil (MV V) einschaltet, sobald ein Merkmal des Kraftstoffs B einen ersten vorab

festgelegten Wert aufweist oder überschreitet, und später
das in der Ventilanordnung angeordnete Rücklaufventil
(MV R) des Ventilsteuerblocks einschaltet, sobald das Merk-
mal des Kraftstoffs B einen zweiten vorab festgelegten Wert
5 aufweist oder überschreitet .

21. Steuervorrichtung nach Anspruch 20, dadurch gekenn-
zeichnet, dass sie das Umschalten des Rücklaufventils rück-
gängig macht, sobald das Merkmal des Kraftstoffs B den ers-
10 ten vorab festgelegten Wert wieder unterschreitet.

GEÄNDERTE ANSPRÜCHE

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1. Kraftstoffversorgungsanlage zur Versorgung einer Brennkraftmaschine über verschiedene Kraftstoffleitungen mit wahlweise einem Kraftstoff aus einem
5 ersten Tank oder einem Kraftstoff aus einem zweiten Tank,
mit einer steuerbaren Ventilanordnung zur Umschaltung zwischen den Kraftstoffen aus dem ersten Tank und aus dem zweiten Tank,
einem Ventilsteuerblock, in den die Ventilanordnung integriert ist, und in den Kraftstoffzuleitungen von den Tanks münden und der die Kraftstoffe über
10 weitere Leitungen an die Einspritzanlage verteilt, und
einer Steuervorrichtung zur Steuerung der Kraftstoffversorgungsanlage durch Steuern der Ventilanordnung abhängig von der Belastung des Motors, dadurch gekennzeichnet, dass
die Steuervorrichtung so aufgebaut ist, dass sie zunächst ein in der Ven-
15 tilanopdnung angeordnetes Vorlaufventil (MV V) einschaltet, sobald ein Merkmal des Kraftstoffs aus dem zweiten Tank einen ersten vorab festgelegten Wert aufweist oder überschreitet, und später das in der Ventilanordnung angeordnete Rücklaufventil (MV R) des Ventilsteuerblocks einschaltet, sobald das Merkmal des Kraftstoffs aus dem zweiten Tank einen zweiten vorab festgeleg-
20 ten Wert aufweist oder überschreitet.
2. Kraftstoffversorgungsanlage nach Anspruch 1, dadurch gekennzeichnet, dass sie das in der Ventilanordnung angeordnete Vorlaufventil (MV V) wieder ausschaltet, sobald ein Merkmal des Kraftstoffs aus dem zweiten Tank den ers-
25 ten vorab festgelegten Wert wieder unterschreitet.
3. Kraftstoffversorgungsanlage nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass die Steuervorrichtung so aufgebaut ist, dass sie das Umschalten des Rücklaufventils (MV R) rückgängig macht, sobald das Merkmal des Kraft-
30 Stoffs aus dem zweiten Tank den zweiten vorab festgelegten Wert wieder unterschreitet
4. Kraftstoffversorgungsanlage nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass der Ventilsteuerblock benachbart zu einem
35 Wärmetauscher zum Aufheizen eines der Kraftstoffe angeordnet ist.

5. Kraftstoffversorgungsanlage nach einem der vorhergehenden Ansprüche, gekennzeichnet durch eine Steuereinrichtung, welche die Kraftstoffversorgung und den Ventilsteuerblock automatisch steuert.
6. Kraftstoffversorgungsanlage nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die Steuervorrichtung zumindest eine Ein-/Ausgabeeinheit mit einem Display aufweist, die in der Fahrgastzelle angeordnet ist.
7. Kraftstoffversorgungsanlage nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die Steuervorrichtung veranlasse dass mindestens das Motor-Einspritzsystem vor einem endgültigen Abstellen der Brennkraftmaschine mit dem anderen Kraftstoff gespült wird.
8. Kraftstoffversorgungsanlage nach Anspruch 7, dadurch gekennzeichnet, dass eine Spülung auch durch Drücken eines Wahlschalters in der Fahrerkabine auslösbar ist.
9. Kraftstoffversorgungsanlage nach Anspruch 7 oder 8, dadurch gekennzeichnet, dass das Spülen durch Drücken eines Wahlschalters in der Fahrerkabine unterdrückbar ist.
10. Kraftstoffversorgungsanlage nach Anspruch 9, dadurch gekennzeichnet, dass die Unterdrückung des Spülen automatisch aufgehoben und das Spülen durchgeführt wird, wenn ein Sensor meldet, dass die Temperatur eines der Kraftstoffe unter einen vorab festgelegten Wert gefallen ist.
11. Brennkraftmaschine mit einer Kraftstoffversorgungsanlage nach einem der vorhergehenden Ansprüche, gekennzeichnet durch mindestens einen Temperatursensor zum Feststellen der Temperatur mindestens eines Mediums, das eine Aussage über den Betriebszustand der Brennkraftmaschine zulässt.
12. Steuervorrichtung zur Steuerung der Kraftstoffversorgungsanlage nach einem der Ansprüche 1 bis 10, dadurch gekennzeichnet, dass die Steuervorrichtung die Last des Motors abschätzt und veranlasst, dass die Kraftstoffversorgung umschaltet, wenn die Last des Motors für eine vorab bestimmte Zeit unterhalb einer vorab bestimmten Last liegt.

13. Steuervorrichtung nach Anspruch 12, dadurch gekennzeichnet, dass sie die Last des Motors aufgrund von Motormanagementdaten ermittelt und die Kraftstoffversorgungsanlage aufgrund der ermittelten Werte umschaltet.

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14. Steuervorrichtung nach einem der Ansprüche 12 oder 13, dadurch gekennzeichnet, dass sie die Kraftstoffversorgungsanlage umschalten kann, wenn nur Nebenaggregate laufen.

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15. Steuervorrichtung nach einem der Ansprüche 12 bis 14, dadurch gekennzeichnet, dass sie durch Öffnen eines in der Ventilanordnung angeordneten Rücklaufventils (MV R) veranlasst, dass im Betrieb mit Kraftstoff aus dem zweiten Tank von der Einspritzpumpe nicht verbrauchter Kraftstoff in den entsprechenden Tank zurückgeführt wird.

15

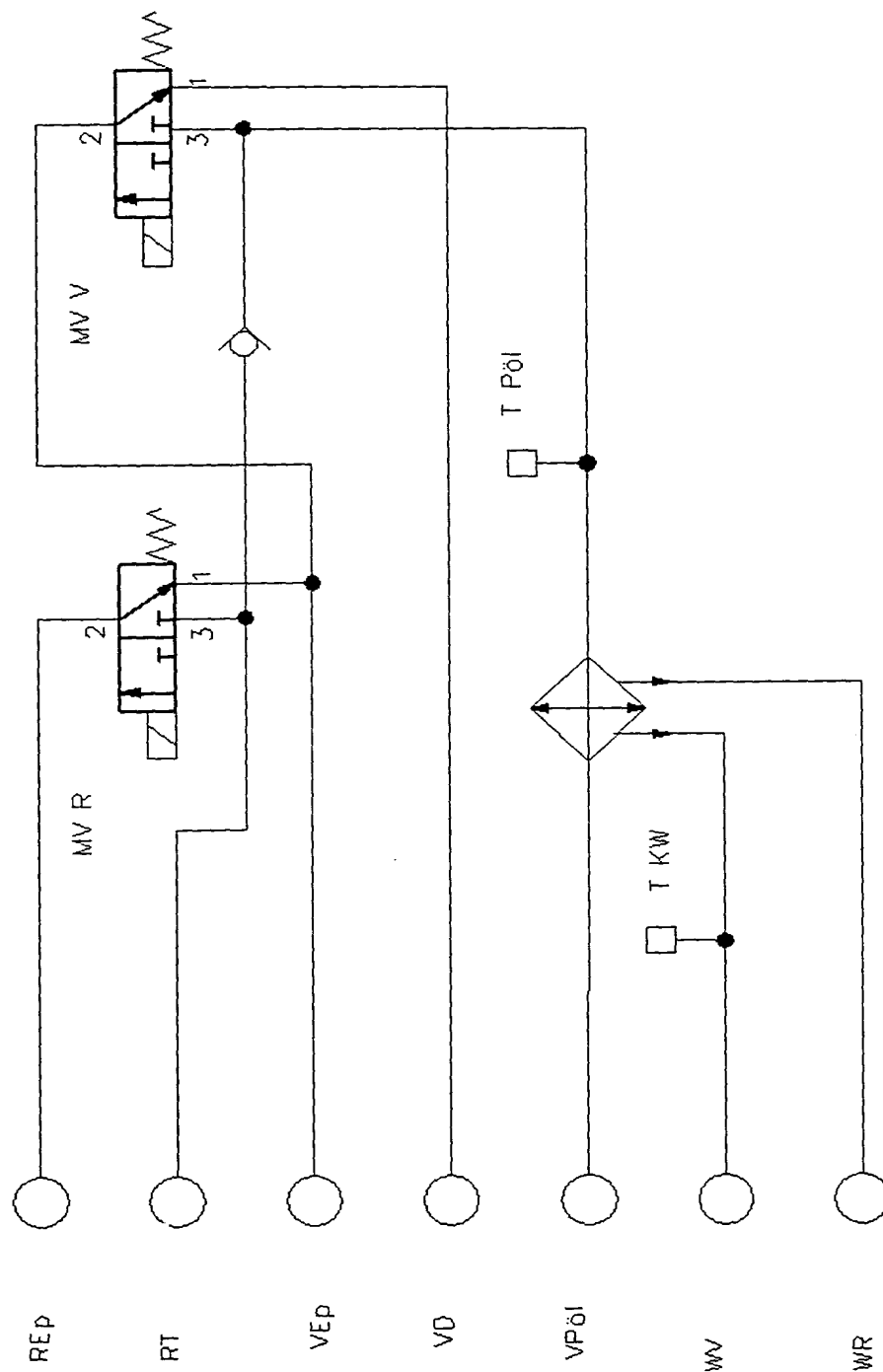
16. Steuervorrichtung nach einem der Ansprüche 12 bis 15, dadurch gekennzeichnet, dass sie einem Bediener eine Möglichkeit bietet, manuell auf Kraftstoff aus dem ersten Tank umzuschalten bzw. die Umschaltung auf Kraftstoff aus dem zweiten Tank manuell zu verhindern.

20

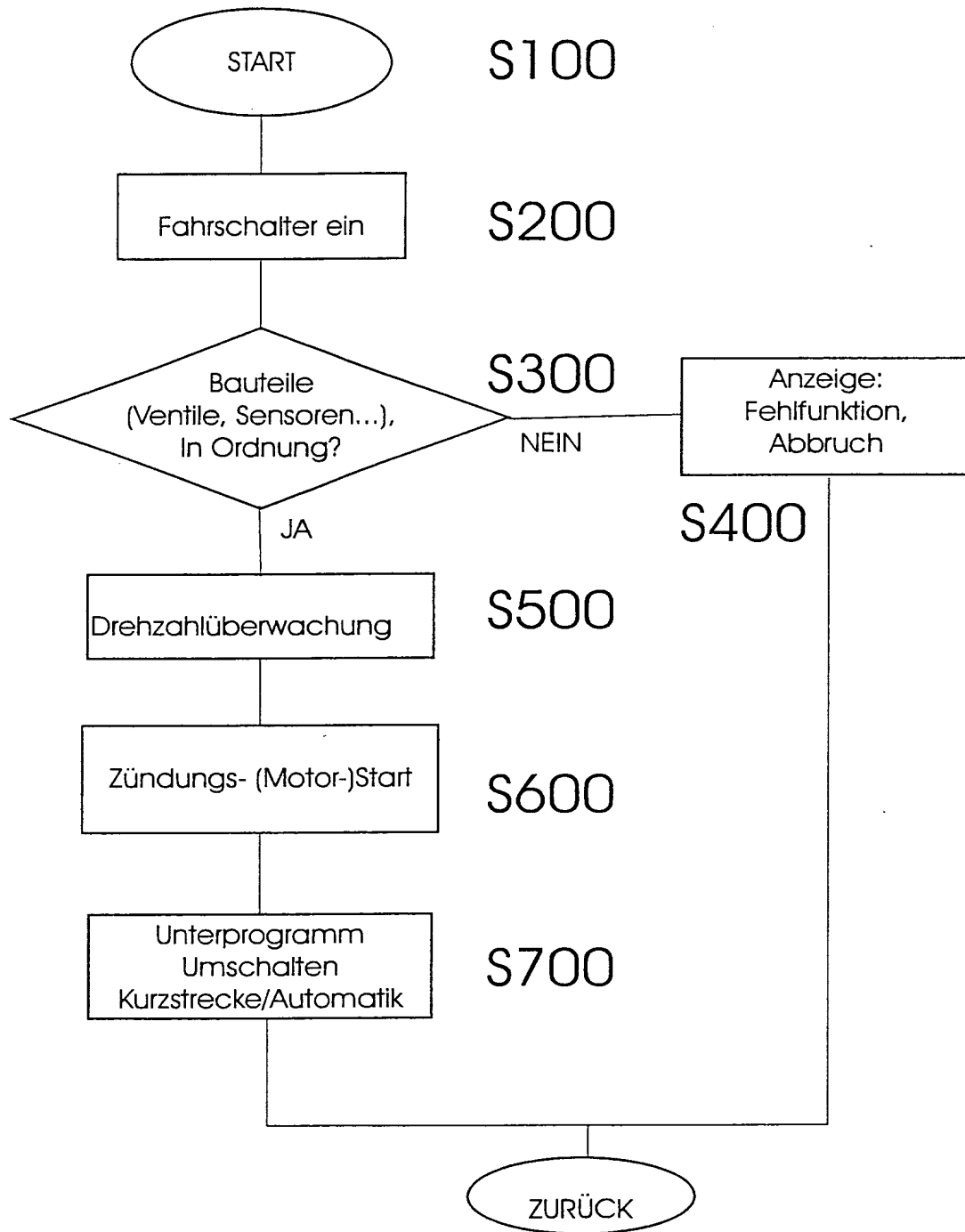
17. Steuervorrichtung nach Anspruch 16, gekennzeichnet durch eine Vorrichtung, um den Bediener daran zu erinnern, dass mit Kraftstoff aus dem zweiten Tank gefahren werden könnte, wenn die dafür erforderlichen Bedingungen vorliegen, der Bediener die Umschaltung auf Kraftstoff aus dem zweiten Tank

25 jedoch manuell verhindert hat.

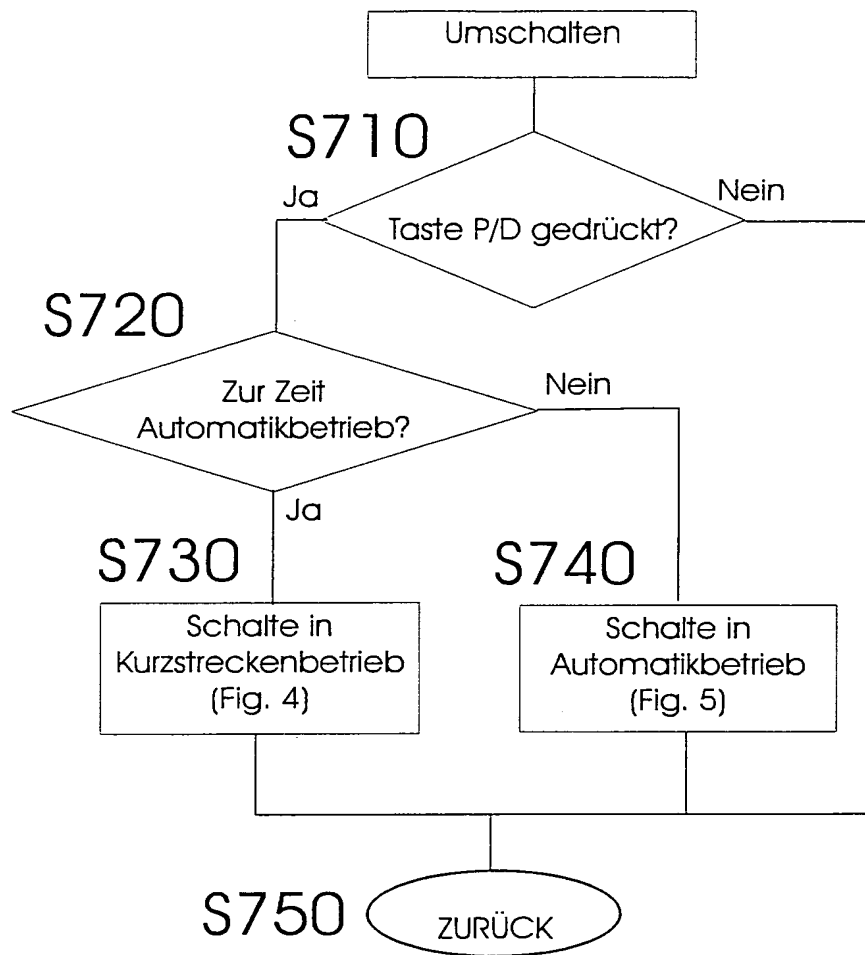
Figur 1



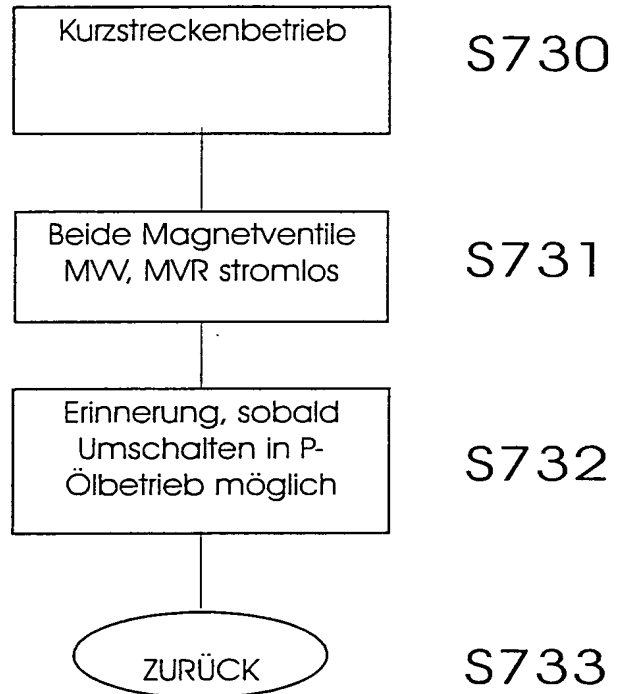
FIGUR 2



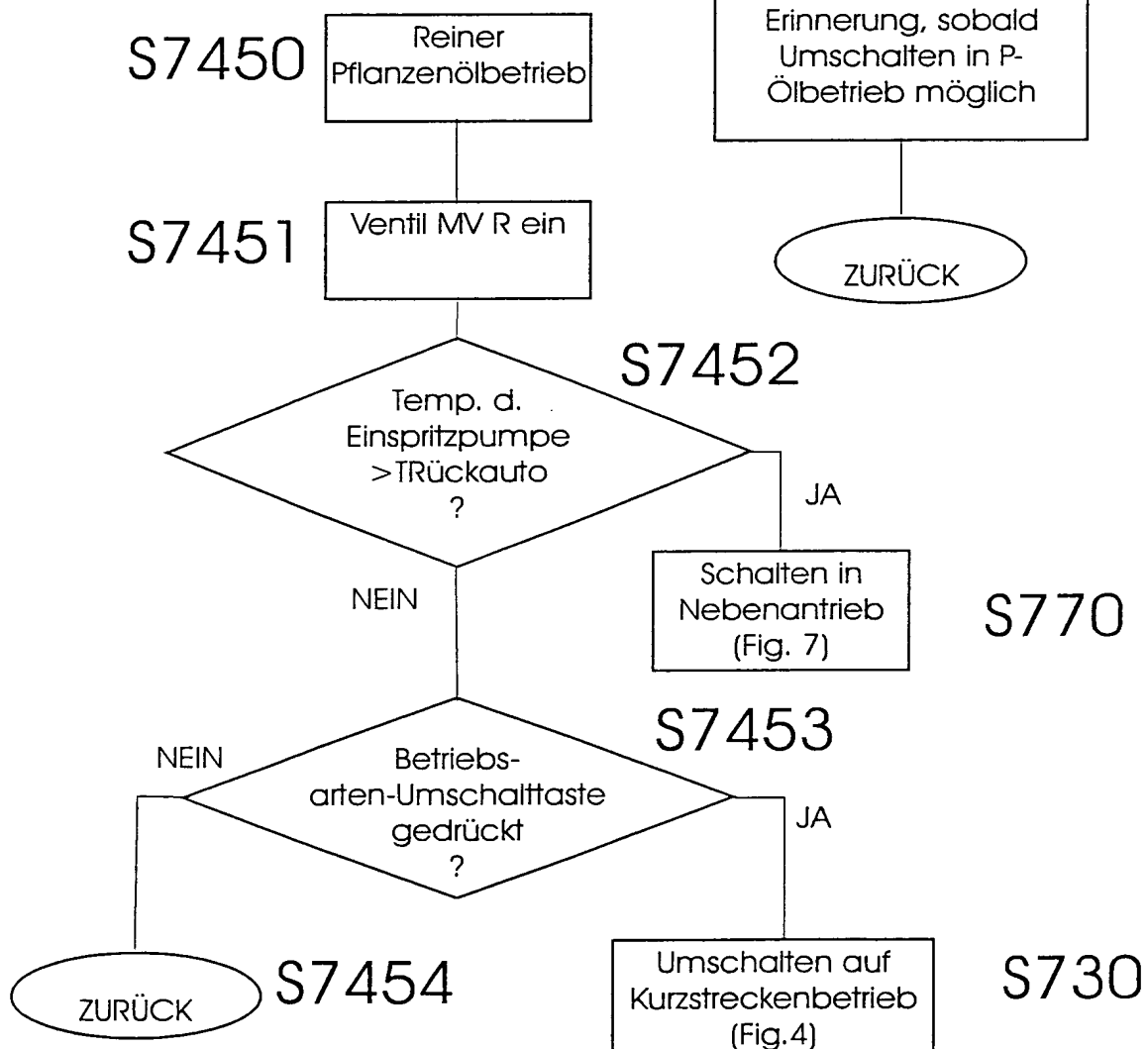
FIGUR 3



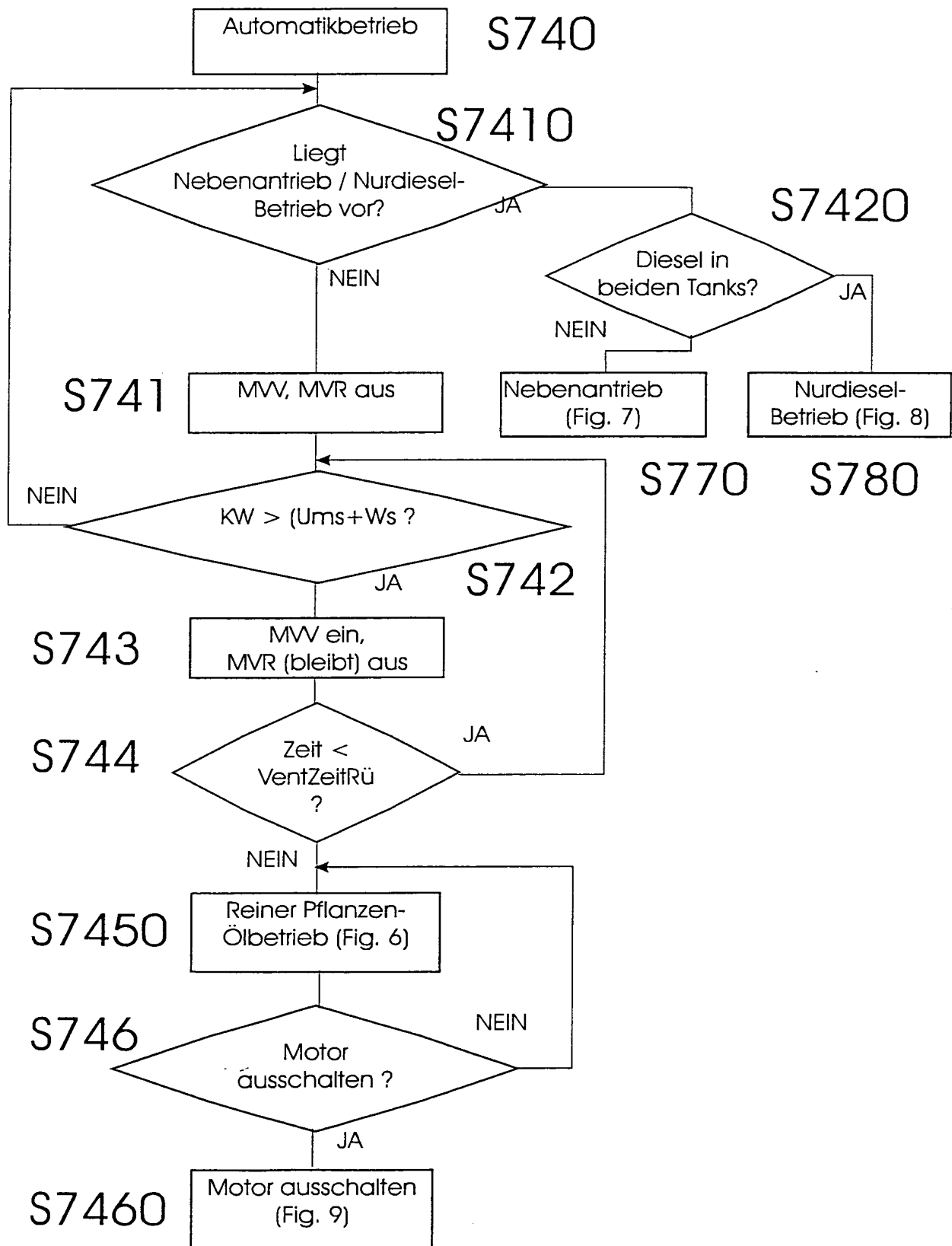
Figur 4



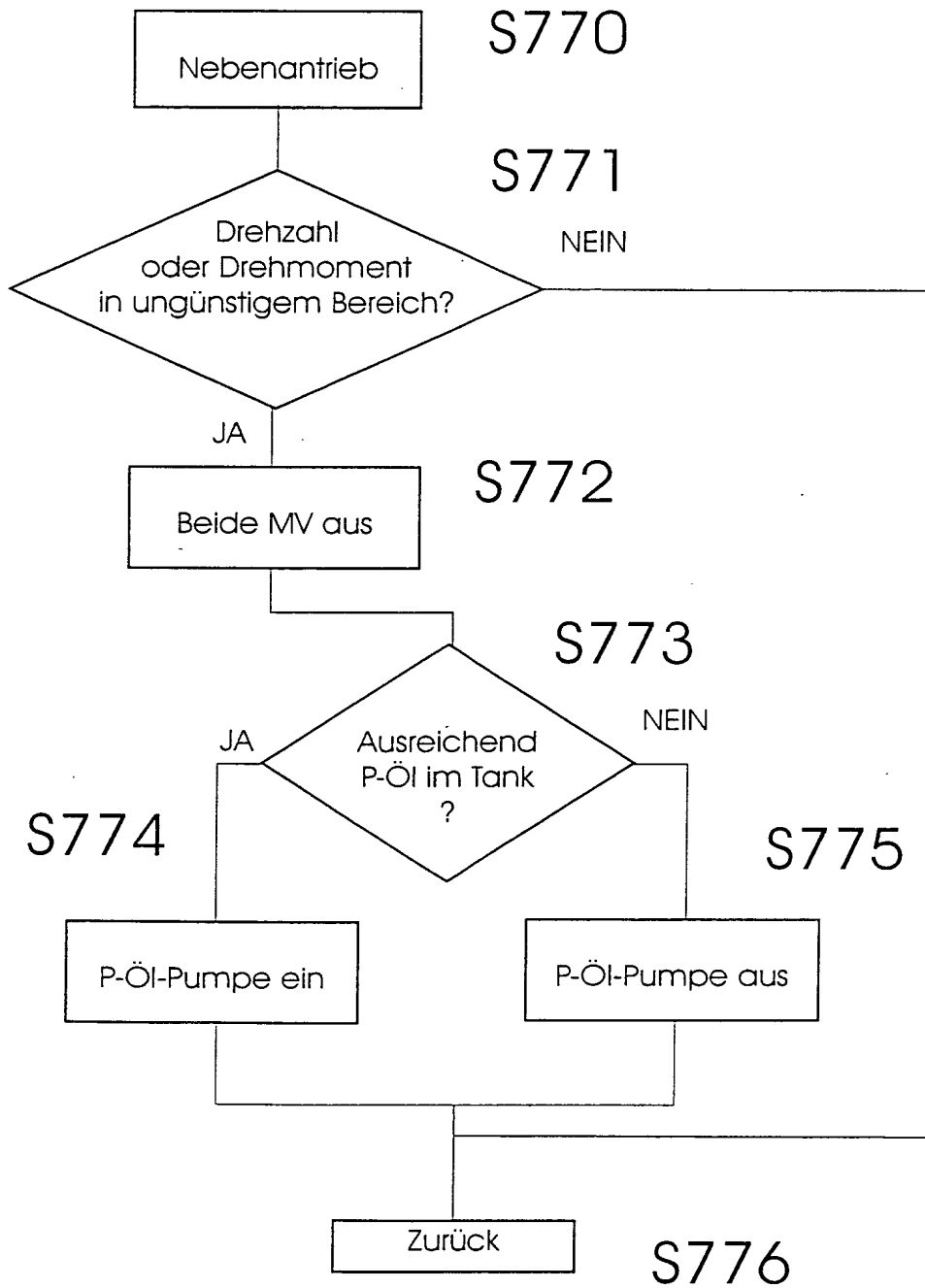
Figur 6



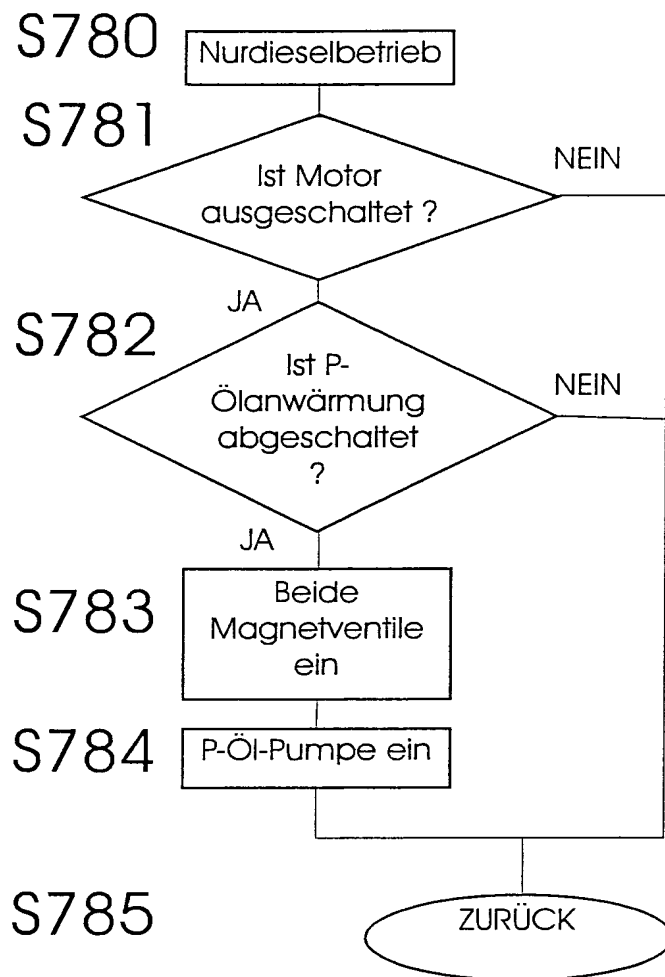
Figur 5



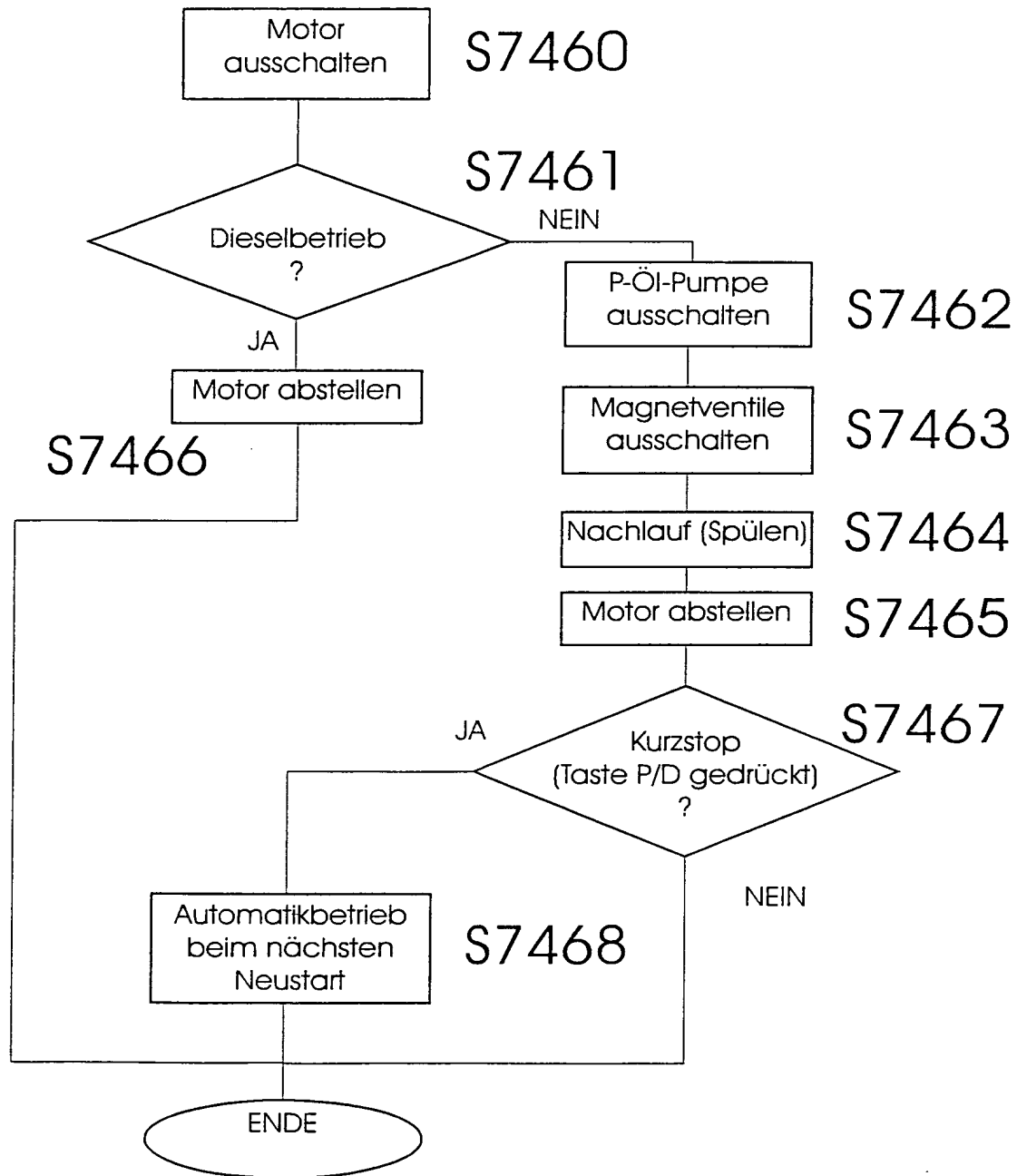
Figur 7



Figur 8



Figur 9



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/010380

A. CLASSIFICATION OF SUBJECT MATTER

INV. F02D19/06
ADD. F02M37/00 F02M31/16 F02M55/02

According to International Patent Classification (IPC) or to both national Classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (Classification System followed by Classification Symbols)
F02D F02M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
X Y A	US 2 984 229 A (VAUGHAN PAUL S) 16 May 1961 (1961-05-16) figures column 1, line 15 - line 47 column 1, line 66 - column 4, line 29	1, 2, 4-6, 10, 13, 18 8, 9, 11, 12 3, 7, 14-17, 19-21
Y A	DE 100 60 573 A1 (FINGER RALPH) 6 September 2001 (2001-09-06) abstract; figures column 2, line 16 - line 47 column 2, line 63 - column 3, line 3 column 3, line 37 - column 4, line 25 ----- -/-	8, 9 1-7, 10-21

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search

7 February 2007

Date of mailing of the international search report

14/02/2007

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Authorized officer

Döring, Marcus

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2006/010380

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
Y	DE 12 03 046 B (WILLY SOSSIAUX) 14 October 1965 (1965-10-14) figures col umn 1, line 1 - line 51 col umn 3, line 20 - line 35	11, 12
A	col umn 4, line 43 - line 63	1-10, 13-21
X	----- DE 196 35 220 AI (LOHMANN GEORG) 14 May 1998 (1998-05-14) abstract ; figures	1,4-6, 10, 13
A	col umn 1, line 3 - col umn 3, line 64	2,3,7-9 , 11, 12, 14-21
X	----- DE 39 29 115 AI (ELSBETT LUDWIG ET AL.) 7 March 1991 (1991-03-07) abstract ; figure	1,4-7, 10, 13-15
A	col umn 1, line 3 - col umn 2, line 7 col umn 2, line 55 - col umn 3, line 8	2,3,8,9 , 11, 12, 16-21
X	----- EP 1 462 636 A2 (AFHYMAT) 29 September 2004 (2004-09-29)	1,4-6, 10, 13, 16, 17
Y	abstract ; figures	2,3
A	col umn 3, line 12 - col umn 6, line 44	7-9, 11, 12, 14, 15, 18-21
Y	----- DE 44 33 500 AI (LOHMANN GEORG) 28 March 1996 (1996-03-28) abstract ; figure	2,3
A	col umn 1, line 19 - line 32	1,4-21
P,X	----- EP 1 647 699 A (KANGLER WOLFRAM) 19 April 2006 (2006-04-19) abstract ; figures col umn 1, paragraph 1 - col umn 2, Paragraph 7 col umn 3, paragraph 14 - col umn 5, paragraph 24 col umn 6, paragraph 29 - col umn 10, paragraph 51	1,2,4, 10
A	----- DE 44 18 856 AI (ROBUR WERKE GMBH I. L.) 7 December 1995 (1995-12-07) abstract ; figures col umn 2, line 13 - line 54	1-21
	----- -/--	

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2006/010380

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	DE 101 54 455 A1 (GENTSCH DIETMAR) 15 May 2003 (2003-05-15) cited in the application abstract ; figures column 1, paragraph 4 - column 3, Paragraph 14 -----	1-21
A	DE 38 00 585 A1 (KLÖCKNER-HUMBOLDT-DEUTZ AG) 28 July 1988 (1988-07-28) cited in the application abstract; figures column 2, line 2 - line 23 column 2, line 66 - column 4, line 53 -----	1-21

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2006/010380

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2984229	A	16-05-1961	NONE
DE 10060573	A1	06-09-2001	NONE
DE 1203046	B	14-10-1965	NONE
DE 19635220	A1	14-05-1998	NONE
DE 3929115	A1	07-03-1991	NONE
EP 1462636	A2	29-09-2004	FR 2853013 A1 01-10-2004
DE 4433500	A1	28-03-1996	NONE
EP 1647699	A	19-04-2006	DE 102004050601 A1 27-04-2006 US 2006081223 A1 20-04-2006
DE 4418856	A1	07-12-1995	NONE
DE 10154455	A1	15-05-2003	NONE
DE 3800585	A1	28-07-1988	NONE

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES

INV. F02D19/06

ADD. F02M37/00 F02M31/16 F02M55/02

Nach der Internationalen Patentklassifikation (IPC) oder nach der nationalen Klassifikation und der IPC

B. RECHERCHIERTE GEBIETE

Recherchierter Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole)

F02D F02M

Recherchierte, aber nicht zum Mindestprüf Stoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)

EPO-Internal , WPI Data

C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
X	US 2 984 229 A (VAUGHAN PAUL S)	1,2,4-6,
Y	16. Mai 1961 (1961-05-16)	10,13,18
	Abbildungen	8,9,11,
		12
A	Spalte 1, Zeile 15 - Zeile 47	
	Spalte 1, Zeile 66 - Spalte 4, Zeile 29	3,7,
		14-17,
		19-21
Y	----- DE 100 60 573 A1 (FINGER RALPH)	8,9
	6. September 2001 (2001-09-06)	
	Zusammenfassung; Abbildungen	
	Spalte 2, Zeile 16 - Zeile 47	
	Spalte 2, Zeile 63 - Spalte 3, Zeile 3	
A	Spalte 3, Zeile 37 - Spalte 4, Zeile 25	1-7,
	-----	10-21
	-/-	

☒ Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen ☐ Siehe Anhang Patentfamilie

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Datum des Abschlusses der internationalen Recherche

7. Februar 2007

Absendedatum des internationalen Recherchenberichts

14/02/2007

Name und Postanschrift der Internationalen Recherchenbehörde

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 Fax: (+31-70) 340-3016

Bevollmächtigter Bediensteter

Döring, Marcus

C. (Fortsetzung) ALS WESENTLICH ANGESEHENE UNTERLAGEN		
Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
Y	DE 12 03 046 B (WILLY GOSSIAUX) 14. Oktober 1965 (1965-10-14) Abbildungen Spalte 1, Zeile 1 - Zeile 51 Spalte 3, Zeile 20 - Zeile 35	11, 12
A	Spalte 4, Zeile 43 - Zeile 63	1-10, 13-21
X	DE 196 35 220 Al (LOHMANN GEORG) 14. Mai 1998 (1998-05-14) Zusammenfassung; Abbildungen	1,4-6, 10, 13
A	Spalte 1, Zeile 3 - Spalte 3, Zeile 64	2, 3, 7-9, 11, 12, 14-21
X	DE 39 29 115 Al (ELSBETT LUDWIG ET AL.) 7. März 1991 (1991-03-07) Zusammenfassung; Abbildung	1,4-7, 10, 13-15
A	Spalte 1, Zeile 3 - Spalte 2, Zeile 7 Spalte 2, Zeile 55 - Spalte 3, Zeile 8	2,3,8,9, 11, 12, 16-21
X	EP 1 462 636 A2 (AFHYMAT) 29. September 2004 (2004-09-29)	1,4-6, 10, 13, 16, 17
Y	Zusammenfassung; Abbildungen	2, 3
A	Spalte 3, Zeile 12 - Spalte 6, Zeile 44	7-9, 11, 12, 14, 15, 18-21
Y	DE 44 33 500 Al (LOHMANN GEORG) 28. März 1996 (1996-03-28) Zusammenfassung; Abbildung	2, 3
A	Spalte 1, Zeile 19 - Zeile 32	1, 4-21
P, X	EP 1 647 699 A (KANGLER WOLFRAM) 19. April 2006 (2006-04-19) Zusammenfassung; Abbildungen Spalte 1, Absatz 1 - Spalte 2, Absatz 7 Spalte 3, Absatz 14 - Spalte 5, Absatz 24 Spalte 6, Absatz 29 - Spalte 10, Absatz 51	1,2,4, 10
A	DE 44 18 856 Al (ROBUR WERKE GMBH I. L.) 7. Dezember 1995 (1995-12-07) Zusammenfassung; Abbildungen Spalte 2, Zeile 13 - Zeile 54	1-21
A	DE 101 54 455 Al (GENTSCH DIETMAR) 15. Mai 2003 (2003-05-15) in der Anmeldung erwähnt Zusammenfassung; Abbildungen Spalte 1, Absatz 4 - Spalte 3, Absatz 14	1-21
	-/-	

C. (Fortsetzung) ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
A	DE 38 00 585 A1 (KLÖCKNER-HUMBOLDT-DEUTZ AG) 28. Juli 1988 (1988-07-28) in der Anmeldung erwähnt Zusammenfassung; Abbildungen Spalte 2, Zeile 2 - Zeile 23 Spalte 2, Zeile 66 - Spalte 4, Zeile 53 -----	1-21

INTERNATIONALER RECHERCHENBERICHT

Angaben zu Veröffentlichungen, die zur selben Patentfamilie gehören

Internationales Aktenzeichen

PCT/EP2006/010380

Im Recherchenbericht angeführtes Patentdokument		Datum der Veröffentlichung	Mitglied(er) der Patentfamilie		Datum der Veröffentlichung
US 2984229	A	16-05-1961	KEINE		
DE 10060573	A1	06-09-2001	KEINE		
DE 1203046	B	14-10-1965	KEINE		
DE 19635220	A1	14-05-1998	KEINE		
DE 3929115	A1	07-03-1991	KEINE		
EP 1462636	A2	29-09-2004	FR	2853013 A1	01-10-2004
DE 4433500	A1	28-03-1996	KEINE		
EP 1647699	A	19-04-2006	DE 102004050601 A1		27-04-2006
			US 2006081223 A1		20-04-2006
DE 4418856	A1	07-12-1995	KEINE		
DE 10154455	A1	15-05-2003	KEINE		
DE 3800585	A1	28-07-1988	KEINE		

Customer No. 26629
Confirmation No. 6187

Patent
Attorney Docket No. CET1090.070

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Sarder et al.
Serial No. : 16/191,503
Filed : November 15, 2018
For : OFF-BOARD FUEL REGULATOR FOR GENERATOR ENGINE
Group Art No. : 3747
Examiner : Kevin A. Lathers

CERTIFICATION UNDER 37 CFR 1.8(a) and 1.10

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Date: August 11, 2022

/Robyn L. Templin/
Signature

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT/RESPONSE TO DECISION ON APPEAL MAILED JULY 11, 2022

Dear Sir:

Responsive to the Decision on Appeal mailed July 11, 2022, please amend the Application as follows and consider the following remarks:

In the Claims

1. (Canceled)

2. (Currently Amended) A dual fuel generator and fuel delivery system comprising:
a dual fuel generator configured to operate on a liquid fuel supplied from a liquid
fuel source through a liquid fuel line and a gaseous fuel supplied from a pressurized fuel source
through a gaseous fuel line;

a fuel regulator system located off board the dual fuel generator, the fuel regulator
system comprising:

a primary pressure regulator coupled to a service valve of the pressurized
fuel source and configured to regulate the fuel supplied from the pressurized fuel source to a
reduced pressure; and

a secondary pressure regulator coupled to the primary pressure regulator
and configured to regulate the gaseous fuel supplied from the primary pressure regulator to a
desired pressure for delivery through the gaseous fuel line to operate the dual fuel generator;

a mechanical fuel valve actuatable between a first position and a second position
to selectively control fuel flow to the dual fuel generator from the liquid fuel source through the
liquid fuel line and the pressurized fuel source through the gaseous fuel line; and

~~The dual fuel generator and fuel delivery system of claim 1 further comprising a~~
fuel lockout apparatus coupled to the mechanical fuel valve; and

wherein when the mechanical fuel valve is in the first position, the fuel lockout
apparatus communicates the liquid fuel source to the dual fuel generator and prevents the
pressurized fuel source from coupling to the dual fuel generator, and actuation of the mechanical
fuel valve to the second position causes the fuel lockout apparatus to permit the pressurized fuel
source to couple to the dual fuel generator, and interrupts the liquid fuel source communication
with the dual fuel generator.

3. (Currently Amended) A dual fuel generator and fuel delivery system comprising:
a dual fuel generator configured to operate on a liquid fuel supplied from a liquid
fuel source through a liquid fuel line and a gaseous fuel supplied from a pressurized fuel source
through a gaseous fuel line;

a fuel regulator system located off board the dual fuel generator, the fuel regulator system comprising:

a primary pressure regulator coupled to a service valve of the pressurized fuel source and configured to regulate the fuel supplied from the pressurized fuel source to a reduced pressure; and

a secondary pressure regulator coupled to the primary pressure regulator and configured to regulate the gaseous fuel supplied from the primary pressure regulator to a desired pressure for delivery through the gaseous fuel line to operate the dual fuel generator; and

a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel generator from the liquid fuel source through the liquid fuel line and the pressurized fuel source through the gaseous fuel line; and

~~The dual fuel generator and fuel delivery system of claim 1,~~ wherein mechanical fuel valve opens and closes the liquid fuel line to selectively control fuel flow from the liquid fuel source to the dual fuel generator; and further comprises:

a fuel lockout apparatus coupled to the mechanical fuel valve and configured to prevent the pressurize fuel source from coupling to the gaseous fuel line while the mechanical fuel valve opens the liquid fuel line, and permit the pressurized fuel source to couple to the gaseous fuel line while the mechanical fuel valve closes the liquid fuel line.

4. (Original) The dual fuel generator and fuel delivery system of claim 3, wherein the fuel lockout apparatus is further configured to prevent the mechanical fuel valve from opening the liquid fuel line while the dual fuel generator receives fuel from the pressurized fuel source.

5. (Currently Amended) The dual fuel generator and fuel delivery system of claim 3, wherein the fuel lockout apparatus further comprises a fuel inlet cover that actuates with the mechanical fuel valve to cover an inlet of the gaseous fuel line while the mechanical fuel valve opens the liquid fuel line and to uncover ~~mechanical fuel lockout switch~~ the inlet of the gaseous fuel line when the mechanical fuel valve closes the liquid fuel line.

6. (Currently Amended) The dual fuel generator and fuel delivery system of claim ~~24~~, further comprising:

a first end of a quick-connect hose coupling coupled to an outlet of the secondary pressure regulator; and

a second end of the quick-connect hose coupling coupled to an inlet of the gaseous fuel line to mate with the first end of the quick-connect hose coupling to couple the secondary pressure regulator to the gaseous fuel line.

7. (Currently Amended) The dual fuel generator and fuel delivery system of claim ~~24~~, further comprising a regulator mounting device secured to the pressurized fuel source with at least the secondary pressure regulator mounted on the regulator mounting device.

8. (Original) The dual fuel generator and fuel delivery system of claim 7, wherein the primary pressure regulator is mounted on the regulator mounting device.

9. (Original) The dual fuel generator and fuel delivery system of claim 8, wherein the pressurized fuel source comprises a pressurized fuel container having a collar; and wherein the regulator mounting device secures to the collar so that the primary and secondary pressure regulators are positioned adjacent each other along an outer periphery of the collar.

10. (Currently Amended) The dual fuel generator and fuel delivery system of claim ~~34~~, wherein the primary and secondary pressure regulators are integral components of a dual stage pressure regulator.

11-21. (Canceled)

22. (Currently Amended) The generator and fuel delivery system of claim ~~24~~ wherein the first and second stages comprise a dual stage regulator configured to regulate the gaseous fuel supplied from the pressurized fuel source and regulate the reduced pressure gaseous fuel, wherein the dual stage regulator is mounted directly onto the pressurized fuel source, off-board from the generator.

23. (Canceled)

24. (Currently Amended) A generator and fuel delivery system comprising:

a generator configured to operate on a gaseous fuel supplied from a pressurized fuel source through a gaseous fuel line;

a fuel regulator system located off-board the generator, the fuel regulator system configured to:

regulate the gaseous fuel supplied from the pressurized fuel source in a first stage, the gaseous fuel regulated down to a reduced pressure in the first stage; and

regulate the reduced pressure gaseous fuel in a second stage, the reduced pressure gaseous fuel from the first stage regulated down to a desired pressure in the second stage for delivery through the gaseous fuel line to operate the generator; and
~~The generator and fuel delivery system of claim 21~~

_____ wherein the generator is free of any pressure regulator.

REMARKS

Claims 1-17, 21, 22, and 24 are pending in the present application. In the Decision on Appeal mailed July 11, 2022, the Patent Trial and Appeal Board affirmed the Examiner's rejection of claims 1-17, 21, and 22 on the ground of nonstatutory double patenting as being unpatentable over claims 1-15 of U.S. Patent No. 10,221,780; affirmed the Examiner's rejection of claims 1, 6, 10-13, 16, and 21 under 35 U.S.C. §103 as being unpatentable over Pursifull et al. (US Pub. 2011/0168133) in view of Sugimoto et al. (US Pub. 2007/0137591) and further in view of GasHoseandRegulators (May 17th, 2014, <https://web.archive.org/web/20140517093401/http://gashosesandregulators.com/> -- hereinafter "GasHose"); affirmed the Examiner's rejection of claims 7-9, 14, 15, 17, and 22 under 35 U.S.C. §103 as being unpatentable over Pursifull et al. in view of Sugimoto et al. and GasHose, and further in view of NoOutage.com (Aug. 27th, 2006, <http://web.archive.org/web/20061113112733/http://www.nooutage.com/40248.htm>).

In response to the Decision on Appeal, a properly executed Terminal Disclaimer is being filed concurrently herewith to obviate the nonstatutory double patenting rejection(s). The \$170 Terminal Disclaimer fee under 37 CFR 120(d) is also being concurrently paid via EFS-WEB. As such, Applicant respectfully requests withdrawal of the double patenting rejection of claims 1-17, 21, and 22 on the ground of nonstatutory double patenting as being unpatentable over claims 1-15 of U.S. Patent No. 10,221,780.

In further response to the Decision on Appeal, Applicant has elected to cancel claims 1, 11-17, and 21 in the present response. Applicant has further elected to amend claims 2-3, 5-7, 10, and 24 in the present response. Claims 2 and 3 are currently amended to incorporate the subject matter of independent claim 1, claims 6-7 have been amended each to depend from claim 2, claim 10 has been amended to depend from claim 3, claim 24 has been amended to incorporate the subject matter of independent claim 21, and claim 22 has been amended to depend from claim 24. Claim 5 has been amended herein to correct a clerical issue by removing "mechanical fuel lockout switch". No new matter has been added.

Applicant further requests consideration of an Information Disclosure Statement (IDS) filed with the present response.

Therefore, in light of at least the foregoing, Applicant respectfully believes that the present application is in condition for allowance. As a result, Applicant respectfully requests timely issuance of a Notice of Allowance for claims 2-10, 22 and 24.

Applicant appreciates the Examiner's consideration of these Remarks and cordially invites the Examiner to call the undersigned, should the Examiner consider any matters unresolved.

Respectfully submitted,

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Espacenet

Bibliographic data: FR2510660 (A1) — 1983-02-04

Two-fuel reservoir system for concrete mixer trucks - uses a solenoid valve actuated by contacts on gear selector and parking brake to provide fuel source changeover

Inventor(s): DERREZ MATHIAS; LOPEZ MICHEL ± (MATHIAS DERREZ ET MICHEL LOPEZ)

Applicant(s): STETTER SA [FR] ± (STETTER SA)

Classification: - **international:** *F02D19/06*; (IPC1-7): B60K15/02; F02D19/06
- **cooperative:** F02D19/0618 (EP); F02D19/0676 (EP);
F02D19/0684 (EP); Y02T10/30 (EP)

Application number: FR19810014723 19810729

Priority number(s): FR19810014723 19810729

Abstract of FR2510660 (A1)

The fuel supply system uses two fuel tanks, each containing different fuel (1,2) and has a controller with a solenoid valve (6) which couples one of the two tanks (1,2) to the engine. The solenoid valve is operated by a relay energised through two series connected electric contacts (16,17). The two contacts are coupled to the gearbox and parking brake, so when the gear lever is placed in neutral and the parking brake engaged the fuel changeover is automatically initiated. Indicator lights (14,15) on the dashboard are supplied by auxiliary contacts (16,17) on the solenoid valve to indicate which fuel reservoir is in use.

A1

**DEMANDE
DE BREVET D'INVENTION**

(21)

N° 81 14723

(54) Système d'alimentation en carburant à deux réservoirs, pour véhicule spécial à moteur unique.

(51) Classification internationale (Int. Cl. ³). F 02 D 19/06; B 60 K 15/02.

(22) Date de dépôt..... 29 juillet 1981.

(33) (32) (31) Priorité revendiquée :

(41) Date de la mise à la disposition du
public de la demande..... B.O.P.I. — « Listes » n° 5 du 4-2-1983.

(71) Déposant : STETTER SA, société anonyme. — FR.

(72) Invention de : Mathias Derrez et Michel Lopez.

(73) Titulaire : *Idem* (71)

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Système d'alimentation en carburant à deux réservoirs, pour véhicule spécial à moteur unique.

L'invention concerne un système d'alimentation en carburant, à deux réservoirs, pour véhicule spécial à moteur unique, destiné à permettre une fonction transport avec un type de carburant et une fonction service à l'arrêt du véhicule avec un autre type de carburant.

L'invention est notamment destinée à équiper les bétonnières mobiles.

Il est connu d'utiliser, pour un même moteur, deux types de carburant au moyen de deux réservoirs et d'une commande d'inversion disposée dans le circuit d'alimentation.

De plus, on connaît des véhicules ou engins qui sont destinés à accomplir une fonction transport ou déplacement et une fonction service lorsqu'ils sont arrêtés, cette fonction étant assurée par le moteur du véhicule. C'est par exemple le cas d'une bétonnière portée par un véhicule et dont le tambour est entraîné par le moteur du véhicule.

Dans ce cas, le véhicule est une partie du temps en déplacement et une autre partie du temps sur un chantier. En déplacement, le moteur sert à la traction du véhicule et éventuellement en même temps à la rotation du tambour. Sur le chantier le véhicule est en stationnement, avec son frein de parcage actionné et sa boîte de vitesse au point mort tandis que le moteur ne sert plus alors qu'à la rotation du tambour.

Avec un double fonctionnement de ce type, il peut être avantageux d'alimenter le moteur avec des carburants différents respectivement pour la fonction transport et pour la fonction service seule. L'avantage est par exemple simplement économique, en utilisant un carburant plus lourd et moins cher pour le service seul et au contraire plus performant pour le transport, comme par exemple respectivement du fioul et du gazole.

C'est pourquoi l'invention propose un système d'alimentation en carburant, à deux réservoirs, pour véhicule spécial à moteur unique, muni de moyens de commande pour alimenter le moteur à partir de l'un ou de l'autre desdits réservoirs et qui est remarquable en ce que les moyens de commande comportent une électro-vanne qui permet de positionner le circuit d'alimentation sur l'un ou l'autre des réservoirs et qui est actionné par un relai, lui-même commandé par les fermetures à la fois de deux

contacteurs électriques en série, lesdites fermetures étant obtenues respectivement par la mise au point mort de la boîte de vitesse du véhicule et par l'actionnement du frein de parcase de telle sorte que le moteur soit alimenté par l'un
5 des réservoirs et un type de carburant en fonctionnement normal de transport et par l'autre réservoir et un autre type de carburant pour un fonctionnement de service seul lorsque le véhicule est à l'arrêt avec sa boîte de vitesse au point mort et son frein de parcase actionné.

10 Pour des raisons de sécurité il est avantageux selon l'invention que l'électro-vanne soit en position d'alimentation sur le réservoir destiné au fonctionnement transport lorsque ladite électro-vanne est au repos, c'est-à-dire non actionnée par le relais.

15 De préférence, dans ce cas deux témoins lumineux sont aménagés pour signaler le réservoir en fonction, ceux-ci étant électriquement alimentés par l'intermédiaire du relais qui ferme le circuit électrique du témoin destiné au réservoir de transport et ouvre le circuit électrique de l'autre témoin lorsque
20 ledit relais est au repos, c'est-à-dire non commandé par les fermtures des contacteurs et au contraire ferme le circuit électrique du témoin destiné au réservoir de service et ouvre le circuit électrique de l'autre témoin lorsque ledit relais est excité par les fermetures en série des deux contacteurs.

25 L'invention sera mieux comprise à la lecture de la description qui va suivre et qui se réfère à la figure unique annexée représentant schématiquement un mode de réalisation selon l'invention pour moteur diesel.

Cette figure montre deux réservoirs 1 et 2 contenant par
30 exemple respectivement du fioul et du gazole. De ces réservoirs partent des circuits d'alimentation munis chacun d'un préfiltre 3, 4 et pour le circuit gazole d'un dispositif anti-retour 5.

Les circuits des deux réservoirs passent par une électro-vanne 6 qui, au repos est en position d'alimentation gazole.

35 Après l'électro-vanne, le circuit unique parvient à la pompe d'alimentation 7 en passant par un bac de visualisation 8, visible de l'extérieur.

Après la pompe 7 le circuit aboutit aux pompes d'injection

9 après avoir traversé un filtre 10.

Comme le montre le dessin, le retour 11 des injecteurs se déverse dans le réservoir 1 de fioul et plus généralement dans le réservoir contenant le carburant le plus lourd et ceci
5 quelque soit le réservoir sélectionné tandis que le retour 12 des pompes est recyclé en amont de la pompe d'alimentation 7.

L'électro-vanne 6 est actionnée par un relais 13 qui, au repos c'est-à-dire non excité, coupe le circuit électrique d'alimentation de l'électro-vanne qui reste alors en position
10 d'alimentation/gazole. Dans cette position le relais ferme en outre le circuit électrique d'un témoin lumineux 14 (par exemple de couleur verte) tandis qu'il ouvre au contraire le circuit électrique d'un autre témoin lumineux 15 (de couleur rouge par exemple).

15 Lorsque le relais 13 est excité comme il sera expliqué ci-après, celui-ci ferme le circuit électrique de l'électro-vanne 6 qui bascule dans sa position alimentation fioul (réservoir 1), ouvre le circuit électrique du témoin 14 qui s'éteint et ferme le circuit électrique du témoin 15 qui s'allume.

20 L'excitation du relais 13, comme le montre le dessin, est obtenue par la fermeture de son circuit d'alimentation électrique au moyen de deux contacteurs en série 16 et 17 qui sont combinés avec respectivement la boîte de vitesse 18 et le frein de parage 19 du véhicule.

25 Les contacteurs 16 et 17 sont tels qu'ils sont ouverts lorsque respectivement la boîte de vitesse 18 est enclenchée sur une vitesse et le frein de parage 19 n'est pas actionné et au contraire fermés lorsque respectivement la boîte de vitesse est au point mort et le frein de parage est actionné.

30 En outre l'ouverture et la fermeture du contacteur 17 entraînent respectivement l'ouverture et la fermeture du circuit électrique d'un autre témoin 20 classique de frein de parage, de même couleur que le témoin 14.

Le fonctionnement est simple à comprendre.

35 En déplacement, le frein 19 n'est pas actionné et la boîte de vitesse enclenchée de telle sorte que le relais 13 n'est pas excité (les contacteurs 16 et 17 étant ouverts).

Dans ces conditions l'électro-vanne est en position

gazole, le témoin 14 est allumé et les témoins 15 et 20 éteints (conditions choisies pour le dessin). Dans ce cas, même la mise au point mort de la boîte ne change pas le type de carburant puisque le contacteur 17 reste ouvert.

5 Lorsque le frein 19 est actionné et que la boîte de vitesse 18 est au point mort, le relais 13 est excité de telle sorte que l'électro-vanne 6 est en position fioul tandis que le témoin 14 est éteint et les témoins 15 et 20 allumés par mise sous tension.

10 Cette disposition présente donc une grande sécurité et un automatisme complet puisque les positions gazole et fioul sont automatiquement obtenues par la mise en fonction elles-mêmes, respectivement déplacement ou transport et service, le véhicule ne pouvant pas rouler sur chantier ou sur route avec
15 du fioul (dans cet exemple). En outre en cas de défaillance électrique, les circuits restent ou passent en alimentation gazole.

 Enfin, comme il a déjà été dit, l'invention est notamment destinée, mais non exclusivement, aux bétonnières portées.

20

REVENDEICATIONS

1. Système d'alimentation en carburant, à deux réservoirs (1,2), pour véhicule spécial à moteur unique, muni de moyens de commande pour alimenter le moteur à partir de l'un
5 ou de l'autre desdits réservoirs, système caractérisé en ce que les moyens de commande comportent une électro-vanne (6) qui permet de positionner le circuit d'alimentation sur l'un ou l'autre des réservoirs (1,2) et qui est actionnée par un relais (13) lui-même commandé par les fermetures à la fois de
10 deux contacteurs électriques en série (16,17), lesdites fermetures étant obtenues respectivement par la mise au point mort de la boîte de vitesse (18) du véhicule et par l'actionnement du frein de parcage (19) de telle sorte que le moteur soit alimenté par l'un des réservoirs (2) et un type de carburant
15 en fonctionnement normal de transport et par l'autre réservoir (1) et un autre type de carburant pour un fonctionnement de service seul lorsque le véhicule est à l'arrêt avec sa boîte de vitesse au point mort et son frein de parcage actionné.

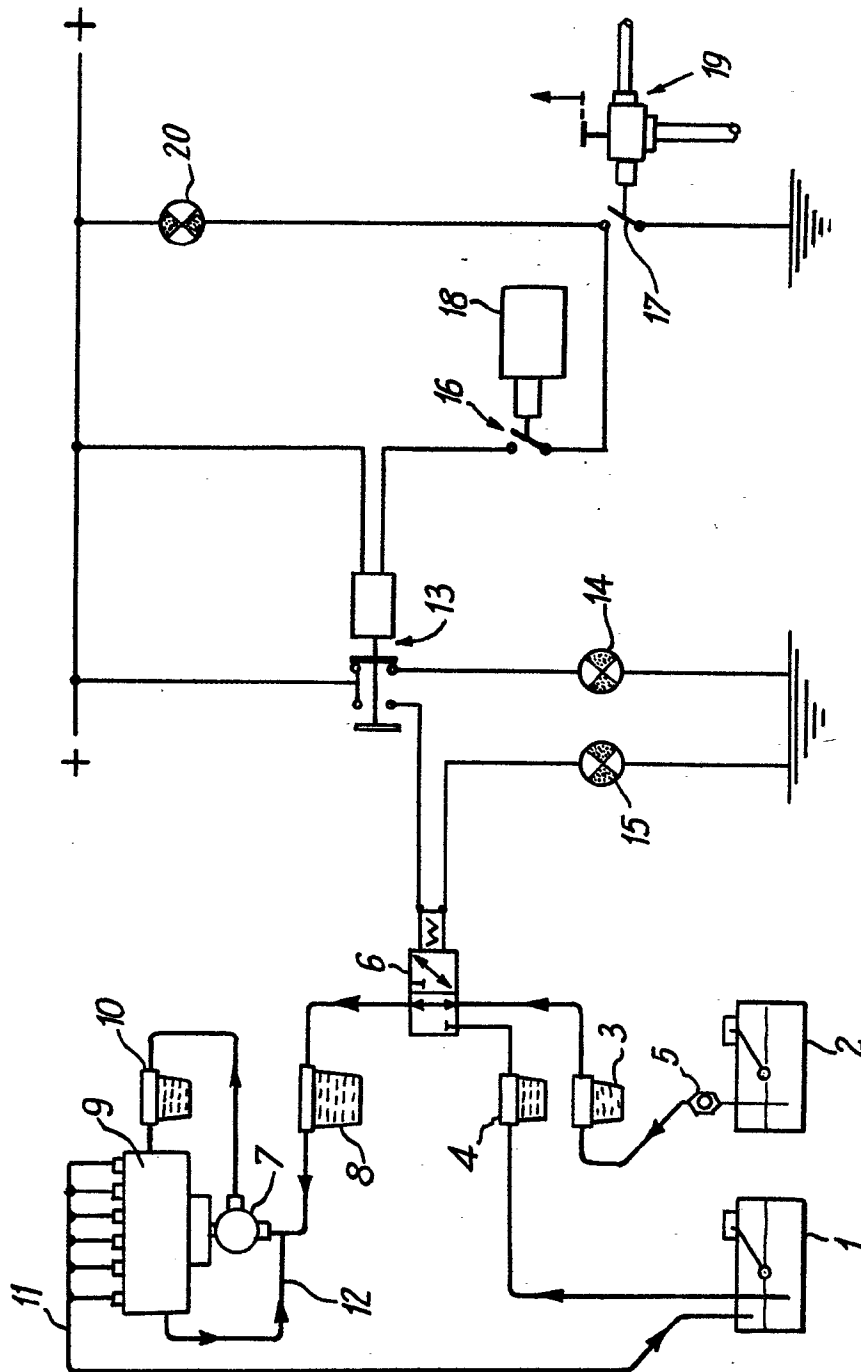
2. Système selon la revendication 1, caractérisé en ce
20 que l'électro-vanne (6) est en position d'alimentation sur le réservoir (2) destiné au fonctionnement transport lorsque la dite électro-vanne est au repos, c'est-à-dire non actionnée par le relais (13).

3. Système selon la revendication 2, caractérisé en ce
25 que deux témoins lumineux (14,15) sont aménagés pour signaler le réservoir en fonction, ceux-ci étant électriquement alimentés par l'intermédiaire du relais (13) qui ferme le circuit électrique du témoin (14) destiné au réservoir (2) de transport et ouvre le circuit électrique de l'autre témoin (15)
30 lorsque ledit relais est au repos, c'est-à-dire non commandé par les fermetures des contacteurs (16,17) et au contraire ferme le circuit électrique du témoin (15) destiné au réservoir (1) de service et ouvre le circuit électrique de l'autre témoin (14) lorsque ledit relais est excité par les fermetures
35 en série des deux contacteurs (16,17).

4. Système selon l'une des revendications 1 à 3, pour moteur diesel, caractérisé en ce que le réservoir (2) destiné à la fonction transport contient du gazole et l'autre réservoir (1) du fioul.

5. Système selon l'une des revendications 1 à 4, caractérisé en ce que le réservoir (2) de transport est muni d'un dispositif anti-retour (5), que les circuits des deux réservoirs sont munis chacun d'un préfiltre (3,4) disposé en amont
5 de l'électro-vanne (6) et qu'un bac de visualisation (8), visible de l'extérieur est prévu dans le circuit aval de l'électro-vanne (6).

6. Système selon l'une des revendications 1 à 5 caractérisé en ce que le véhicule est une bétonnière mobile et que
10 le moteur unique assure d'une part le déplacement du véhicule et éventuellement en même temps, la rotation du tambour lorsque ledit moteur est alimenté par le réservoir (2) de transport et d'autre part seulement la rotation du tambour lorsqu'il
est alimenté par le réservoir (1) de service, c'est-à-dire
15 lorsque ledit véhicule est en position fixe, sur chantier par exemple.





ELECTRONIC PAYMENT RECEIPT

APPLICATION #
16/191,503

RECEIPT DATE / TIME
08/11/2022 11:00:14 AM ET

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CET1090.070

Title of Invention

DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 6187

FILED BY Robyn Templin

PATENT CENTER # 60863142

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CORRESPONDENCE
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INVENTOR Mark J. Sarder

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Exhibit 1003, Page 328

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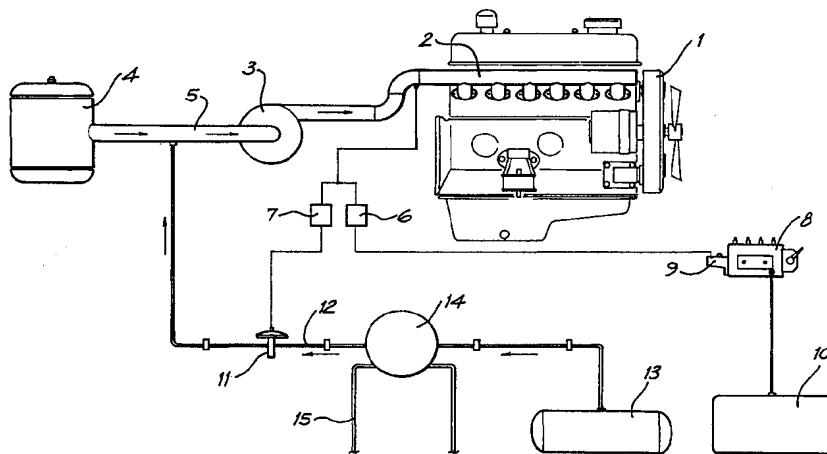
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(21) International Application Number: PCT/AU98/00500 (22) International Filing Date: 30 June 1998 (30.06.98) (30) Priority Data: PO 7634 30 June 1997 (30.06.97) AU (71)(72) Applicant and Inventor: BAILEY, Gregory, Rex [AU/AU]; 3 Valley View Close, Milton, NSW 2538 (AU). (74) Agent: HODGKINSON, Hugh, Rudyard; H.R. Hodgkinson & Co., Level 3, 20 Alfred Street, Milsons Point, NSW 2061 (AU).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>

(54) Title: A DUAL-FUEL METHOD FOR BOOST FUEL SUBSTITUTION IN TURBO-CHARGED DIESEL ENGINES

(57) Abstract

An assembly for boost fuel substitution in turbo charged diesel engines; the assembly including: a diesel engine including an inlet manifold (2) and an exhaust manifold; a turbocharger (3) in communication with said inlet manifold (2); first and second reservoirs of diesel (10) and gas (13) respectively selectively in communication with said engine; a fuel injection pump (8) including an aneroid (9) intermediate the first reservoir of diesel (10) and said inlet manifold (2); a control valve (11) intermediate the second reservoir of gas (13) and said inlet manifold (2); characterised in that the assembly includes at least two solenoids (6, 7) each capable of moving between first and second operational states; wherein a first of said solenoids (6) is located between the inlet manifold (2) and said fuel injection pump (8) and the second solenoid (7) is located between said inlet manifold (2) and said control valve (11) wherein, said first solenoid (6) responsive to a predetermined engine operating parameter moves between a first state in which pressurised air from said inlet manifold (2) communicates with said aneroid (9) and atmospheric air is isolated from the aneroid (9) and a second state in which manifold air to the fuel injection pump (8) is interrupted and atmospheric air is in communication with the aneroid (9) and pressurised air from said inlet manifold (2) terminates at said first solenoid (6); and wherein the second solenoid (7) responsive to said predetermined engine operating parameter and/or signal is located between said inlet manifold (2) and said control valve (11) and moves between a first state in which atmospheric air is in communication with said control valve (11) and second state in which pressurised air from said inlet manifold (2) is in communication with said control valve (11); wherein when the first solenoid (6) isolates said first fuel type, the second solenoid (7) operates responsive to a signal to allow boost fuel provided by said second fuel type to communicate between the second fuel source (13) and the engine.



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A DUAL-FUEL METHOD FOR BOOST FUEL SUBSTITUTION IN TURBO-CHARGED DIESEL ENGINES

BACKGROUND

5 The present invention relates to fuel systems and more particularly relates to a system in which a second fuel is admitted as a substitution for boost fuel in a turbo-charged diesel engine. The invention also relates to a dual fuelling system which may be retro-fitted in a simple manner to an existing single-fuel turbo-charged diesel engine.

PRIOR ART

10 Diesel engine operation is typically controlled by the fuel injection pump. Turbo-charged diesel engines introduce a degree of complexity to the control of the engine, over normally aspirated diesel engines due to the fact that the amount of air admitted to each cylinder for each cycle (air charge), changes as a result of the change in manifold air
15 pressure. This change in air charge coupled to the requirement to run diesel engines lean, requires the inlet manifold pressure to be an input to any system controlling the engine. Therefore, on turbo-charged diesel engines, typically a pressure line connects the inlet manifold to an aneroid on the injection pump to facilitate the variation in fuel flow rate due to variations of inlet manifold pressure.

20 Other means of facilitating this variation of fuel flow rate are known. For example, one system electronically senses the manifold pressure, then the output of the electronic sensor is processed, with the output of this processor electrically driving an electromagnetic device associated with the injection pump.

25 US patent 4,517,928 (corresponds to Australian application 17878/83) discloses an existing system for using a gas such as LPG as a secondary boost fuel in diesel engines. According to the arrangement shown in the US patent a signal proportional to the momentary effect of fuel consumption controls the gas supply to the engine. A valve in a
30 gas supply line is connected to a control lever of the engine governor to allow gas supply only in a load range above approximately 25% and up to a maximum of approximately 40% of the full load total fuel consumption. In the lower range, incomplete combustion

of the gas is avoided and in the high low range destination and overload are avoided and the opacity of the exhaust is improved. The consumption of liquid fuel is reduced and the exhaust gas composition is improved. An adjustable stop in the arrangement described limits the maximum injectable liquid fuel quantity when the engine is operated
5 in a dual fuel mode. Whilst it is known to retrofit a dual fuel system incorporating diesel fuel and boost LP gas fuel as a substitution for diesel fuel, the known arrangements require considerable interference with the existing engine equipment and more particularly requires significant interference with the diesel fuel pump and aneroid. Whilst US patent 4,517,928 teaches no intervention into the inside of the fuel pump or
10 the governor there is still required at the outside of the fuel pump a stop for a control lever. Thus, a limiter for the control rod has to be added increasing the labour in retrofitting.

Dual fuel systems used with diesel engines involve a mixture of diesel and gas wherein
15 gas is used as boost fuel responsive to changes in a predetermined engine parameter. The principle of this system is to save diesel fuel by injecting a lesser quantity and replacing this with lower cost LPG and also to avoid diesel exhaust smoke at full load running.

20 This inevitably results in power loss so in order to regain the original power LPG is added to the inlet air. According to the modification is effected so that the engine will have the same power with dual fuel as if it was using a 100% diesel. At fuel engine power load about 30% diesel can be replaced. When more diesel is replaced the engine will demonstrate a phenomenon known as knocking will stop at part load where peak
25 pressures in the cylinders are lower more diesel fuel can be replaced by LPG up to about 40%. At less than a quarter of full load of the engine no LPG may be added to the inlet system because of insufficient combustion.

INVENTION

30 The present invention provides an alternative boost fuel substitution system for a diesel engine which may be used in conjunction with and retro fitted to existing fuel systems.

The dual fuel system according to the present invention is characterised by the inclusion of a second fuel in place of diesel fuel which would in single fuel operation have been introduced to the engine due to an increase in the inlet manifold air pressure as a result of the turbo-charger, and an increase in throttle position, typically known as boost fuel.

- 5 The system according to the present invention is particularly suitable for retro-fitting to conventional diesel engines without disassembly of the injection pump.

In one form, the invention is further characterised by the interruption of the manifold air pressure input to the injection pump, and the substitution for the variation of diesel fuel
10 flow in dependence on manifold pressure and the metering of a second fuel in response to a chosen engine operating parameter or a combination of parameters. Suitable parameters include engine revolutions per minutes (R.P.M.), inlet manifold pressure, throttle position and diesel fuel flow rate. Preferably, the total fuel admitted to the engine is controlled so as to maintain the overall air-fuel-ratio in the lean range.

- 15 According to the present system, the signal sent to the injection pump to indicate that the manifold air pressure has increased, is interrupted. The interruption makes the injection pump behave as if the inlet manifold air pressure is close to atmospheric. This disables the ability of the injection pump to add the boost diesel fuel to the engine. The boost
20 diesel fuel is substituted with a second fuel. The second fuel is admitted to the engine by a means other than the injection pump used for the diesel fuel. Typically, this is by a separate injection system (for direct injection) or by admission to the inlet manifold.

In one broad form the present invention comprises:

- 25 an assembly for boost fuel substitution in a turbo charged diesel engine; the assembly including;
- a diesel engine including an inlet manifold and an exhaust manifold;
 - a turbocharger in communication with said inlet manifold;
 - first and second reservoirs of two alternate fuel types in communication with said
30 engine;
 - a fuel injection pump including an aneroid intermediate a first reservoir of one of said two fuel types and said inlet manifold;

a control valve intermediate a second reservoir of said fuel types and said inlet manifold;

characterised in that the assembly includes at least two solenoids each capable of moving between two states of operation; wherein a first of said solenoids is located
5 between the inlet manifold and said fuel injection pump and the second solenoid is located between said inlet manifold and said control valve;

wherein, said first solenoid responsive to a predetermined engine operating parameter moves between a first state in which pressurised air from said inlet manifold communicates with said aneroid and isolates atmospheric air and a second state in which
10 manifold air to the fuel injection pump is interrupted and atmospheric air is in communication with the aneroid and pressurised air from said inlet manifold terminates at said first solenoid;

and wherein the second solenoid responsive to said predetermined engine operating parameter or a second parameter is located between said inlet manifold and
15 said control valve and moves between a first state in which atmospheric air is in communication with said gas metering valve and a second state in which pressurised air from said inlet manifold is in communication with said control valve and atmospheric air is isolated from control valve;

wherein when the first solenoid isolates said first fuel type, the second solenoid
20 operates to allow boost fuel provided by said second fuel type to communicate between the second fuel source and the engine.

Preferably the aneroid is in direct contact with pressurised air from the manifold and responds to that pressure. Alternatively, the aneroid is in electrical contact with a sensor
25 attached at or near said inlet manifold such that the sensor after sensing the air pressure in the manifold causes a signal to be transmitted to the aneroid.

In another form the present invention comprises;

an assembly for boost fuel substitution in turbo charged diesel engines; the
30 assembly including;

a diesel engine including an inlet manifold and an exhaust manifold;

a turbocharger in communication with said inlet manifold;

first and second reservoirs of two alternate fuel types in communication with said engine;

a fuel injection pump including an aneroid intermediate the first reservoir of one of said two fuel types and said inlet manifold;

5 a control valve intermediate a second reservoir of said fuel types and said inlet manifold;

characterised in that the assembly includes at least two solenoids each capable of moving between two states of operation; wherein a first of said solenoids is located between the inlet manifold and said fuel injection pump and the second solenoid is
10 located between said inlet manifold and said control valve;

wherein, said first solenoid responsive to a predetermined engine operating parameter moves between a first state in which pressurised air from said inlet manifold communicates with said aneroid and isolates atmospheric air and a second state in which manifold air to the fuel injection pump is interrupted and atmospheric air is in
15 communication with the aneroid and pressurised air from said inlet manifold terminates at said first solenoid;

and wherein the second solenoid responsive to said predetermined engine operating parameter or a second parameter is located between said inlet manifold and said control valve and moves between a first state in which atmospheric air is in
20 communication with said gas metering valve and second state in which pressurised air from said inlet manifold is in communication with said control valve and atmospheric air is isolated from the control valve;

wherein when the first solenoid is in its second state, the second solenoid is in its second state such that when first fuel is isolated from the engine by operation of the first
25 solenoid, the operation of the second solenoid allows delivery of boost fuel from the second fuel source to the engine.

In another broad form the present invention comprises:

a system for boost fuel substitution in a turbo charged diesel engine of the high
30 speed type;

the system including a diesel engine including an inlet manifold and an exhaust manifold, a turbocharger in communication with said inlet manifold;

a first fuel reservoir of diesel fuel and a second reservoir of gas fuel each available for delivery to said engine;

a diesel fuel injection pump including an aneroid intermediate the first reservoir and the inlet manifold;

5 a gas control valve intermediate the second reservoir and the inlet manifold for regulating the pressure of gas supplied from the second reservoir;

wherein the system further includes first and second solenoids each capable of movement between two states of operation; wherein the first of said solenoids is located between the inlet manifold and said diesel fuel pump and the second is located between
10 the inlet manifold and said gas control valve;

wherein the operation of each said solenoid is responsive to a predetermined engine operating parameter;

said first solenoid moves between a first operating condition in which the inlet manifold pressure is in communication with the aneroid and fuel pump and a second
15 operating condition in which the inlet manifold pressure is isolated from said fuel pump limiting flow of diesel to the engine to a predetermined maximum and ambient air is accessible to the aneroid;

said second solenoid moves between a first operating condition in which gas fuel is isolated from the engine and ambient air is in communication with the gas control
20 valve and a second operating condition in which gas fuel is in communication with said diesel engine wherein when the first solenoid is in its first operating state the second solenoid is in its first operating state and when the first solenoid is in its second operating state the second solenoid is in its second operating state;

wherein the solenoids are influenced by an electrical signal or signals initiated by
25 a sensor or sensor which detects a predetermined engine operating parameter or parameters.

In another broad form the present invention comprises;

a system for boost fuel substitution in a turbo charged diesel engine; the system
30 including;

a diesel engine including an inlet manifold and an exhaust manifold;

a turbocharger in communication with said inlet manifold;

first and second reservoirs of diesel and gas respectively selectively in communication with said engine;

a fuel injection pump including an aneroid intermediate the first reservoir of diesel and said inlet manifold;

5 a control valve intermediate the second reservoir of gas and said inlet manifold; characterised in that the system includes a single solenoid capable of moving between two operational states;

wherein said single solenoid is located intermediate the inlet manifold and the fuel pump and control valve such that the solenoid is capable of allowing communication
10 between the first or second fuel and the engine responsive to a single dictated by a predetermined engine operating parameter;

wherein said single solenoid moves between a first operational state which allows communication between pressurised air from the inlet manifold and said aneroid and isolates pressurised air access to said gas control valve and a second operational state in
15 which communication between the inlet manifold and the aneroid of the fuel pump is isolated and communication between the inlet manifold pressurised air and the control valve is allowed;

wherein when the solenoid is in its first operational state the first fuel is delivered to the engine and when the solenoid is in its second operational state boost fuel
20 comprising the second fuel is substituted for the first fuel wherein the solenoid operates responsive to predetermined engine operating parameters.

The advantages of the boost fuel substitution system of the present invention, when fitted to a turbo-charged diesel engine include the following:

25 the process of adapting a turbo-charged diesel engine to dual-fuelled operation can be achieved without disassembly of the injection pump, nor does it require any physical alteration to the internal mechanisms of the injection pump or the body of the injection pump. Because the injection pump has not been modified, any repairs or calibration of the injection pump can still be carried out according to the manufacturer's specifications.

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The system can be converted back to 100% diesel operation while the engine is in operation. Through the use of a gaseous second fuel, typically liquefied petroleum gas

or natural gas, particulate emissions can be reduced. Since only the boost component of the diesel fuel is replaced with the second fuel, knock problems associated with high substitution levels of gaseous second fuels can be avoided. This occurs due to the fact that the boost fuel flow rate typically represents less than 45% of the total fuel flow rate, based on energy flow per unit time. Knock problems associated with gaseous second fuels typically occur at higher substitution levels. Rough idle problems associated with some high substitution level, dual-fuelled engines are avoided. At idle, there is no significant boost of the inlet manifold air pressure, above ambient conditions. Therefore, at idle, the engine would be operating on or very close to 100% diesel.

10

The present invention will now be described in more detail according to a preferred but non limiting embodiment and with reference to the accompanying illustrations:

Figure 1: shows a schematic layout of the relationship of the duel solenoid arrangement fitted to a dual fuel system;

15 Figure 2: shows a cross sectional elevation of a dual change over solenoid arrangement according to a preferred embodiment wherein a first solenoid prevents communication between the inlet manifold and an aneroid and the other solenoid activates boost fuel;

Figure 3: shows the arrangement of figure 2 whereby the first solenoid allows communication between the inlet manifold and the aneroid and the second solenoid allows communication between a gas control valve and ambient air thereby preventing passage of boost fuel to the engine;

20

Figure 4: shows an alternative to the arrangement of figures 2 and 3 with the position of the ambient air access port in the gas circuit altered and which activates the gas fuel circuit and renders the primary fuel circuit inactive;

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Figure 5: shows the solenoid arrangement of figure 4 wherein the gas fuel circuit is inactivated by the second solenoid and the first solenoid allows communication between the inlet manifold and aneroid; and

Figure 6: shows a typical circuit diagram describing electrical links between the battery source and operating solenoids.

30

The invention will be described, by way of example only, with reference to two embodiments for interruption to the inlet manifold air pressure input to the injection pump.

- 5 The first is one in which a connection is made between the inlet manifold, downstream of the turbo-charger, and an aneroid associated with the injection pump. The second system is one in which the inlet manifold air pressure is electronically sensed, and an electrical input is made to the injection pump.
- 10 Referring to figure 1 there is shown a schematic layout of an assembly for substitution of boost fuel in a diesel engine according to one embodiment. Figure 1 shows conventional diesel engine 1 including an inlet manifold 2 in communication with turbo charger 3. Turbocharger 3 is in communication with a conventional air cleaner 4 via air line 5.
- 15 According to a preferred embodiment, the assembly comprises co-operating dual solenoids 6 and 7 the first of which is located intermediate the inlet manifold 2 and fuel pump 8. Solenoid 6 is in communication with an aneroid 9 associated with fuel pump 8 via a pressurised air line which allows according to one embodiment aneroid 8 to detect either directly or via a signal generated by a sensor at or near the inlet manifold the level
- 20 of air pressure at inlet manifold 2. Fuel pump 8 is connected to a diesel fuel reservoir 10 from which diesel fuel is delivered to the engine responsive to engine operating parameters. Solenoid 7 is in communication with inlet manifold 2 and a gas metering valve 11 which regulates flow of gas along gas supply line 12 from a reservoir 13 of LP gas which comprises the second fuel. Supply line 12 further includes a conventional
- 25 converter 14 wherein LP gas is converted to a vapour in a known manner. Hot water from the engine via line 15 converts the liquid to a vapour and in doing so warms the gas from stop the unit freezing as LPG when released from the liquid state to form a gaseous state. The gas travels along line 12 towards gas metering valve 11 which is operated by a switch from the foot cycle. The switch may be one of the magnetic type or alternative
- 30 form of switch to suit requirements. Once the gaseous vapour engages gas metering valve 11, turbo charger 3 at this time is not generating pressure although the foot throttle switch turns the system on at the solenoid valve downstream of gas metering valve 11.

According to one form of operation, gas metering valve 11 allows LP gas to travel responsive to the action of solenoid 7 into the engine. As the LP gas is boost fuel, no gas can enter the engine until such time as the turbo charger 3 generates enough pressure to push on a diaphragm inside gas metering valve 11 which in turn activates a plunger enabling gas feed through the metering valve. If turbo pressure is low the introduction of gas into the engine is very light but as turbo pressure increases, this will have the effect of opening gas metering valve 11 in order to increase the flow rate of gas to the engine. Thus, the turbo charger does not activate until the engine is in a high torque condition at which time the turbo charger operates. When this occurs, instead of the diesel fuel pump 8 advancing boost fuel towards the engine when gas is delivered to the engine responsive to a predetermine engine operating parameter, diesel fuel cannot enter the engine. Gas cannot enter the engine until such time as turbo charger 3 starts to operate as the torque value of the engine enters its upper range. Isolating inlet manifold air pressure from aneroid 9 of fuel pump 8 isolates diesel fuel and allows LP gas to be substituted as boost fuel. Parameters employed in the interruption of the inlet manifold air pressure input to the injection pump resulting in metering of the second fuel based on some or all of the following:

engine R.P.M, inlet manifold air pressure, throttle position, flow rate of the diesel fuel and adding the second fuel to the engine.

20

Figures 2 to 5 describe in more detail the operation of the dual solenoid arrangement according to a preferred embodiment of the invention.

Referring to figure 2 there is shown an enlarged cross sectional view of a dual solenoid circuit 20 which establishes intermittent links between an inlet manifold of a diesel engine and two alternative fuel sources. The dual solenoid in circuit 20 to be described below corresponds to solenoids 6 and 7 of figure 1. Dual solenoid circuit 20 includes a first solenoid 21 which is placed intermediate, engine manifold 2 and fuel pump 8 with aneroid 9. Dual solenoid circuit 20 further includes second solenoid 22 disposed intermediate inlet manifold 2 and gas metering valve 11 which controls access to a second fuel from reservoir 13. First solenoid 21 controls the passage of primary diesel fuel from reservoir 10 and interrupts the primary fuel flow circuit normally responsive to

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manifold air pressure such that primary fuel may be isolated responsive to a predetermined engine parameter enabling second solenoid 22 to provide substitute boost fuel to the diesel engine. In normal operation the engine is supplied with diesel fuel from fuel source 10 with the amount of fuel delivered to the engine responsive to air pressure

5 at the inlet manifold. The dual solenoid system which also includes turbo charger 3 operates in response to increased pressure generated by the turbo charger which is delivered to the inlet manifold 2. According to one embodiment a signal is sent to the injection pump 8 to indicate that the manifold air pressure has increased. This causes interruption to the supply of diesel fuel and isolates fuel pump 8 from manifold air

10 pressure such that ambient air is then in communication with the aneroid 9. Solenoid 21 includes solenoid body 23 having an internal chamber 24 which, subject to the position of plunger valve 25, able to communicate with air delivery line 26, chamber 27 and pressurised air chamber 28. Solenoid 21 further includes an upper body 29 housing an actuating mechanism energised by a control circuit which is linked to the control circuit

15 via electrical linkage 30. The actuating mechanism includes biasing spring 31 which operates responsive to an electrical signal via link 30 such that plunger valve 25 moves between a location wherein gate 32 is free of orifice 33 and bears via surface 34 on shoulder 35 of orifice 36 and a second position in which plunger 25 bears via surface 37 on shoulders 38 of orifice 33. The action of plunger valve 25 is regulated by electrical

20 signals responsive to detection of inlet manifold pressure. As shown, plunger valve 25 of first solenoid 21 restricts the flow of pressurised air along pressurised airline 39 such that pressurised air from inlet manifold is unable to travel beyond pressurised air chamber 28. This allows ambient air to enter solenoid body 23 via port 40 such that ambient air is delivered via delivery air line 26 to aneroid 9. Accordingly the configuration of first

25 solenoid 21 and more particularly the position of plunger valve 25 indicates that boost fuel is isolated from the diesel engine from the first fuel source in favour of substitution of boost fuel from the second fuel source. Second solenoid 22 has a similar configuration to that described for first solenoid 21 but second solenoid 22 is dispersed between inlet manifold 2 and gas metering valve 11. When first solenoid 21 isolates the

30 fuel from a first fuel source when the aneroid detects ambient air pressure, second solenoid 22 operates to establish communication between inlet manifold 2 and second fuel or boost fuel source. As shown in figure 2 second solenoid 22 is configured

similarly to first solenoid 21 and includes solenoid body 50, ambient air chamber 51 in communication with port 52 which is open to atmospheric air and orifice 53 defined by shoulder 54 which receives oscillating plunger valve 55. Plunger valve 55 includes gate 56 which when communication is open between the boost fuel source and the inlet manifold, locates on shoulder 54. Solenoid body 50 further includes pressurised air chamber 56 which is in permanent communication with inlet manifold 2. Solenoid body 55 further includes upper shoulder 57 which acts as a bearing surface for upper surface 58 of plunger 55 when pressurised air from inlet manifold is isolated from boost fuel reservoir 13. In this configuration ambient air is available via port 52 and air chamber 51 to gas metering valve 11. When that occurs, plunger valve 25 of solenoid 21 engages shoulder region 38 via surface 37 in order to open communication between inlet manifold 2 and first fuel reservoir 10 via aneroid fuel pump.

Figure 3 shows the arrangement set out in figure 2 and is numbered in accordance with the integers of figure 2. The fundamental difference between the arrangement in figure 3 and that shown in figure 2 is that in figure 3 solenoid 21 seats on shoulder 38 via gate 32 so as to enable communication between pressurised air at the inlet manifold and the first fuel source. Sealing orifice 33 prevents ambient air access to aneroid 9 which ensures that the primary diesel fuel will be delivered to the engine. Plunger valve 25 will close access to ambient air once activated by the electrical control circuit in response to inlet manifold pressure. At the same time, second solenoid 22 closes the pressurised air circuit and allows access of ambient air via chamber 51 to gas metering valve 11. Referring to figure 4 there is shown an alternative dual solenoid arrangement 50 shown in figure 4 includes solenoid 51 which is identical to solenoid 21 shown in figure 3. Furthermore, solenoid 51 operates in an identical manner to that described for solenoid 21. Where dual solenoid arrangement 50 differs from that described in figures 2 and 3 is the arrangement of solenoid 60 which is configured differently from the corresponding solenoid 22 described in the dual solenoid arrangement 20 in figure 3. Solenoid 60 includes solenoid body 61 having an internal chamber 62, which subject to the position of plunger 63 will allow communication by air delivery line 64 between gas metering valve 11 (see figure 1) and inlet manifold 2 (see figure 1). When plunger 63 is retracted there is free communication of pressurised air between inlet manifold 2 and gas metering valve

11 and in this configuration gate 65 seats on shoulder 66 of orifice 67 isolating internal chamber 68. Solenoid arrangement 50 shows solenoid 51 isolating pressurised air in pressurised air line 69 from aneroid 9. In this configuration ambient air is in direct communication with aneroid 9 preventing flow from diesel fuel to the engine. The
5 fundamental difference between solenoid 22 and solenoid 60 is the position of the ambient air chamber and the opposite operation of valves 56 and 63 respectively in respect of their position when pressurised air is in communication with the gas moving valve and when ambient air is in communication with the gas metering valve. These differences are merely a matter of manufacturing choice or selection enabling a possible
10 selection of solenoids which operate differently but performing a similar roll sequentially isolating or allowing access to respective fuels.

Figure 5 shows the arrangement of figure 4 this time plungers 70 and 63 respectively are both seated against corresponding orifices as distinct from opposing orifices to allow
15 communication between inlet manifold and aneroid 9 in the case of solenoid 51 and isolate pressurised air from inlet manifold 2 to gas control valve. Figures 4 and 5 therefore illustrate an alternative configuration for the second solenoid by virtue of the alternative location of ambient air port 71.

20 In a more general sense one solenoid valve may be employed to control the dual fuel system. In this case a valve which has two inputs and two outputs is used whereby the inlet manifold air pressure would be connected to the one input and atmospheric pressure would be connected to the second input. This is illustrated in Figure 7. The outputs of the valve would be connected to the aneroid associated with the injection pump, and the
25 input to the second fuel metering system. The valve could be configured in such a way that when the valve is de-energised, the inlet manifold air pressure would be connected to the injection pump aneroid, and the gas metering system would be connected to atmospheric pressure. Typically, if atmospheric pressure is input to the second fuel metering system, the second fuel would not be admitted to the engine. Therefore, with
30 the valve in the de-energised state, the engine would be under 100% diesel operation.

When the valve is energised, the inlet manifold air pressure would be connected to the second fuel metering system and the injection pump aneroid would be connected to atmospheric pressure, and the engine would be operating in dual-fuel mode. Since the injection pump registers the manifold pressure as being atmospheric or close to atmospheric, it will behave as if there is no boost air being admitted to the engine and will not admit boost diesel fuel to the engine.

Although this embodiment has been described with only one valve, it is acknowledged that it may be achieved with more than one valve, and it may be achieved with valves with more than two inputs, and or more than two outputs. Furthermore, the valve switching may be opposite to that described above, in that the valve can be used whereby in the energised state, the inlet manifold air pressure would be connected to the injection pump aneroid. The valve would typically be electro-mechanical, such as a solenoid so that switching the valve on and off can be achieved remotely and quickly.

In the second system, the electrical connection from the manifold air pressure sensor would be interrupted as illustrated in Figure 8. A reference signal would be sent to the processor which has the electrical properties which are characteristic of the sensor output when the inlet manifold air pressure is close to ambient.

Metering of the second fuel should be constrained to maintain the overall engine operation to be lean. This is desirable to ensure that the production of particulates is not in violation of emission control legislation. The second fuel flow may be introduced to the engine in a variety of known ways, including manifold introduction (commonly referred to as fumigated introduction for gas) or by a second injection system which may or may not be direct in-cylinder injection.

The function of the system will be described below in reference to an engine that has a connection between the inlet manifold and the aneroid associated with the injection pump. The input to the injection pump could alternatively be taken from the outlet of the turbocharger compressor.

The valve is energised when some critical constraints are met. These constraints would include some or all of the following:

- Sufficient fuel level in the second fuel tank
- 5 Engine oil pressure is above a present valve
- Engine R.P.M. is between set limits
- Throttle position is between set limits

If the valve is energised, atmospheric air pressure is exposed to the aneroid associated with the diesel injection pump and the diesel injection pump does not admit boost diesel fuel. The second fuel metering system admits the second fuel essentially to supplement the loss of the boost diesel fuel. The metering process is done according to the engine conditions as listed above. If the valve is de-energised, the diesel pump will admit the boost diesel fuel as required. This change-over between dual-fuel operation and 100% diesel fuel operation can occur with the engine in operation.

The circuit shown in figure 6 includes a power source 80 formed by a conventional battery which may be isolated by a conventional on/off switch 81. Included in the circuit is a reset switch 82 which is in electrical communication with storage reservoir 83 via actuating solenoid 84. Another part of the circuit links relays which together link the two circuits which in turn are linked to a mercury switch 85. The mercury switch is useful should a vehicle become involved in an accident altering its attitude dramatically in which case the mercury switch will immediately isolate the system immediately shutting down the flow of electricity to the solenoid 84 on gas tank 83 preventing any further flow of liquid LPG anywhere through the system. This provides a safety feature and will minimise risk in the event of a fire. In addition to the mercury switch is pressure switch 86 which enables pressure control. This switch keeps pressure from the gas bottle at a certain level and keeps the circuit open on the energising side of relays 87. If the pressure drops off by way of a ruptured line or the like or if the vehicle runs out of gas this will immediately break the circuit and will convert the relay 87 to the off position. In this position the throttle switch 88 will be isolated which in turn will shut off the solenoid on the downstream side of the gas metering valve. If the throttle switch is

not operating because there is no power to it, the system will be immediately closed down. The circuit will also close down via the coil which operates a second relay. If there is no power to the second relay such that red indicator light comes on which indicates that the gas is off and this isolates the whole system from operating. If the gas tank is full and the circuit operates relay 1 and in turn operates relay 2, this will operate change over solenoid valve 90 and 91 thus when solenoid 90 is normally open when there is no power on it the system returns from gas operation to solely diesel fuel operation. In this condition the air pressure from the turbo charger is delivered to the aneroid on the fuel pump according to normal operation. When the turbo charger is operative and pressure is on the gas tank and the on/off switch is on, this changes a relay so that a normally closed relay opens and one normally open closes. This results in air pressure from the pressure side of the turbo charger being isolated from the aneroid and being diverted back through the system and onto the metering valve of the gas. When this happens, green light 92 illuminates on the dashboard of the vehicle indicating that gas is on. Where a driver of the vehicle puts his foot on the throttle it automatically opens the shut off solenoid on the downward side of the metering valve allowing gas to flow when the turbo charger builds up enough pressure to open the metering valve. The circuit also includes reset switch 82 just in case the vehicle runs out of gas to compensate for inability to turn the gas back on as the pressure switch has opened the circuit and no power can be delivered through the line, so it is essential to have a reset button. As soon as the reset button is activated this enables power to the tank solenoid 84 which as a consequence allows liquid to flow through the line which operates pressure switch 86. Once the operator's finger is removed from the reset button the circuit remains open because relay number 1 and number 2 are activated creating an opposite circuit effect.

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It will be recognised by persons skilled in the art that numerous variations and modifications may be made to the invention as broadly described herein without departing from the overall spirit and scope of the invention.

THE CLAIMS:

1. An assembly for boost fuel substitution in turbo charged diesel engines; the assembly including;
 - a diesel engine including an inlet manifold and an exhaust manifold;
 - a turbocharger in communication with said inlet manifold;
 - first and second reservoirs of diesel and gas respectively selectively in communication with said engine;
 - a fuel injection pump including an aneroid intermediate the first reservoir of diesel and said inlet manifold;
 - a control valve intermediate the second reservoir of gas and said inlet manifold;
 - characterised in that the assembly includes at least two solenoids each capable of moving between first and second operational states; wherein a first of said solenoids is located between the inlet manifold and said fuel injection pump and the second solenoid is located between said inlet manifold and said control valve;
 - wherein, said first solenoid responsive to a predetermined engine operating parameter moves between a first state in which pressurised air from said inlet manifold communicates with said aneroid and atmospheric air is isolated from the aneroid and a second state in which manifold air to the fuel injection pump is interrupted and atmospheric air is in communication with the aneroid and pressurised air from said inlet manifold terminates at said first solenoid;
 - and wherein the second solenoid responsive to said predetermined engine operating parameter and/or signal is located between said inlet manifold and said control valve and a moves between a first state in which atmospheric air is in communication with said gas metering valve and second state in which pressurised air from said inlet manifold is in communication with said control valve;
 - wherein when the first solenoid isolates said first fuel type, the second solenoid operates responsive to a signal to allow boost fuel provided by said second fuel type to communicate between the second fuel source and the engine.
2. An assembly for boost fuel substitution in turbo charged diesel engines; the assembly including;
 - a diesel engine including an inlet manifold and an exhaust manifold;

a turbocharger in communication with said inlet manifold;

first and second reservoirs of diesel and LP gas respectively in communication with said engine;

a fuel injection pump including an aneroid intermediate a first reservoir of one of said two fuel types and said inlet manifold;

a control valve intermediate a second reservoir of said fuel types and said inlet manifold;

characterised in that the assembly includes at least two solenoids each capable of moving between first and second operational states; wherein a first of said solenoids is located between the inlet manifold and said fuel injection pump and the second solenoid is located between said inlet manifold and said control valve;

wherein, said first solenoid responsive to a predetermined engine operating parameter moves between a first state in which pressurised air from said inlet manifold communicates with said aneroid and atmospheric air is isolated from the aneroid and a second state in which manifold air to the fuel injection pump is interrupted and atmospheric air is in communication with the aneroid and pressurised air from said inlet manifold terminates at said first solenoid;

and wherein the second solenoid responsive to said predetermined engine operating parameter is located between said inlet manifold and said control valve and moves between a first state in which atmospheric air is in communication with said gas metering valve and a second state in which pressurised air from said inlet manifold is in communication with said control valve;

wherein when the first solenoid is in its second state, the second solenoid is in its second state such that when first fuel is isolated from the engine by operation of the first solenoid, the operation of the second solenoid allows delivery of boost fuel from the second fuel reservoir to the engine.

3. A system for boost fuel substitution in a turbo charged diesel engine of the high speed type;

the system including a diesel engine including an inlet manifold and an exhaust manifold, a turbocharger in communication with said inlet manifold;

a first fuel reservoir of diesel fuel and a second reservoir of gas fuel each available for delivery to said engine;

a diesel fuel injection pump including an aneroid intermediate the first reservoir and the inlet manifold;

a gas control valve intermediate the second reservoir and the inlet manifold for regulating the pressure of gas supplied from the second reservoir;

wherein the system further includes first and second solenoids each capable of movement between two states of operation; wherein the first of said solenoids is located between the inlet manifold and said diesel fuel pump and the second is located between the inlet manifold and said gas control valve;

wherein the operation of each said solenoid is responsive to a predetermined engine operating parameter;

said first solenoid moves between a first operating condition in which the inlet manifold pressure is in communication with the aneroid and fuel pump and a second operating condition in which the inlet manifold pressure is isolated from said fuel pump limiting flow of diesel to the engine to a predetermined maximum and ambient air is accessible to the aneroid;

said second solenoid moves between a first operating condition in which gas fuel is isolated from the engine and ambient air is in communication with the gas control valve and a second operating condition in which gas fuel is in communication with said diesel engine wherein when the first solenoid is in its first operating state the second solenoid is in its first operating state and when the first solenoid is in its second operating state the second solenoid is in its second operating state;

wherein the solenoids are influenced by an electrical signal or signals initiated by a sensor or sensor which detects a predetermined engine operating parameter or parameters.

4. An assembly according to claim 1, 2 or 3 wherein the engine operating parameters include; engine revolutions per minute, inlet manifold pressure, throttle position and diesel fuel flow rate.
5. An assembly according to claim 4 wherein the gas control valve is located intermediate the second solenoid and said LP gas fuel source; said control valve operating in response to an electrical signal dictated by said operating parameters.
6. An assembly according to claim 5 wherein inlet manifold pressure may be determined from an outlet of said turbocharger.

7. An assembly according to claim 6 wherein inlet manifold pressure is measured by a sensor electrically connected to a circuit which includes said first and second solenoids.
8. An assembly according to claim 7 wherein the air pressure of the inlet manifold is sensed electrically by means of an electronic sensor which transmits a signal to one or both said solenoids.
9. An assembly according to claim 8 wherein the air pressure of the inlet manifold is mechanically sensed at said fuel pump.
10. An assembly according to claim 9 wherein the flow of said second fuel is regulated so as to ensure a lean mix.
11. A system for boost fuel substitution in a turbo charged diesel engine; the system including;
 - a diesel engine including an inlet manifold and an exhaust manifold;
 - a turbocharger in communication with said inlet manifold;
 - first and second reservoirs of diesel and gas respectively selectively in communication with said engine;
 - a fuel injection pump including an aneroid intermediate the first reservoir of diesel and said inlet manifold;
 - a control valve intermediate the second reservoir of gas and said inlet manifold;
 - characterised in that the system includes a single solenoid capable of moving between two operational states;
 - wherein said single solenoid is located intermediate the inlet manifold and the fuel pump and control valve such that the solenoid is capable of allowing communication between the first or second fuel and the engine responsive to a single dictated by a predetermined engine operating parameter;
 - wherein said single solenoid moves between a first operational state which allows communication between pressurised air from the inlet manifold and said aneroid and isolates pressurised air access to said gas control valve and a second operational state in which communication between the inlet manifold and the aneroid of the fuel pump is isolated and communication between the inlet manifold pressurised air and the control valve is allowed;
 - wherein when the solenoid is in its first operational state the first fuel is delivered to the engine and when the solenoid is in its second operational state boost fuel

comprising the second fuel is substituted for the first fuel wherein the solenoid operates responsive to predetermined engine operating parameters.

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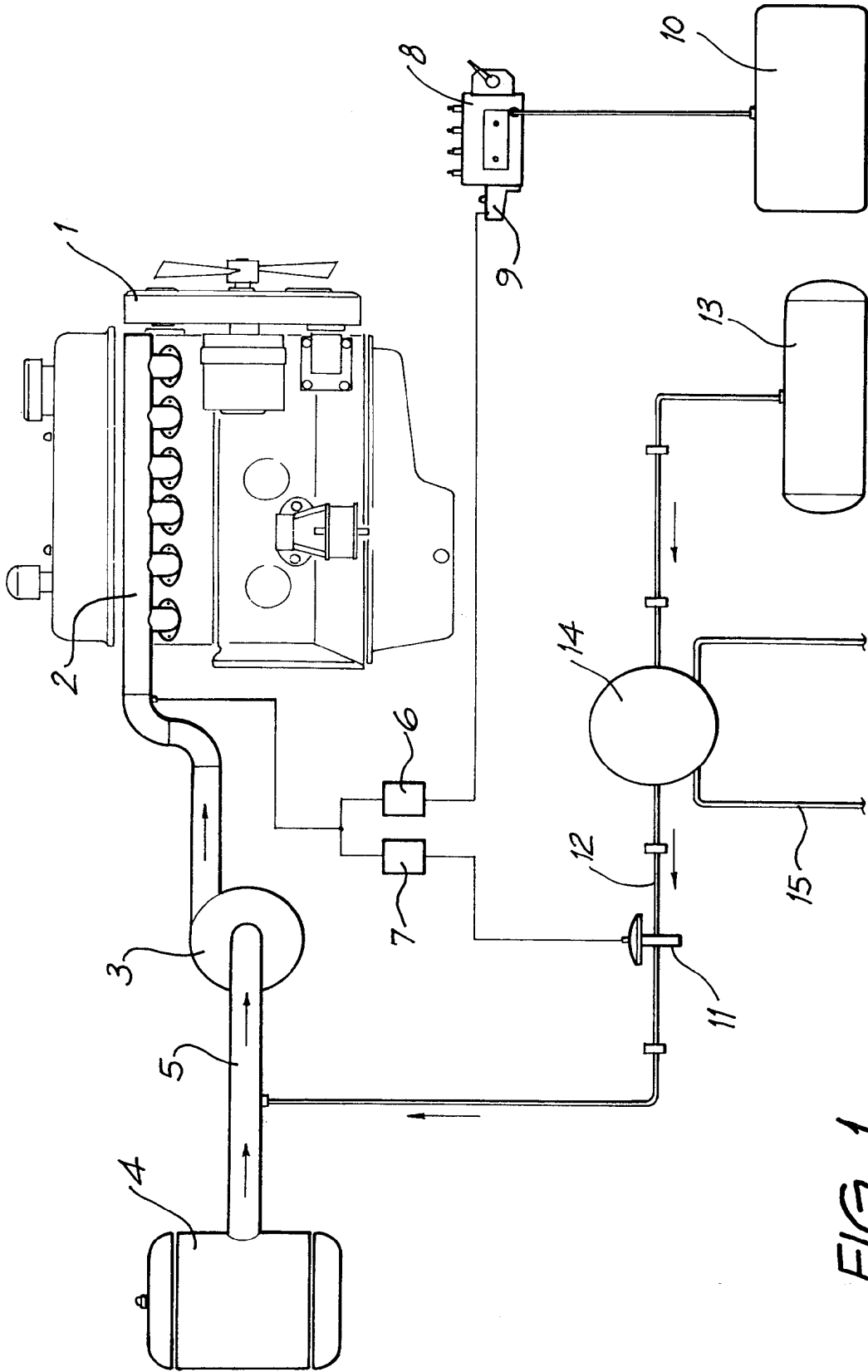


FIG. 1

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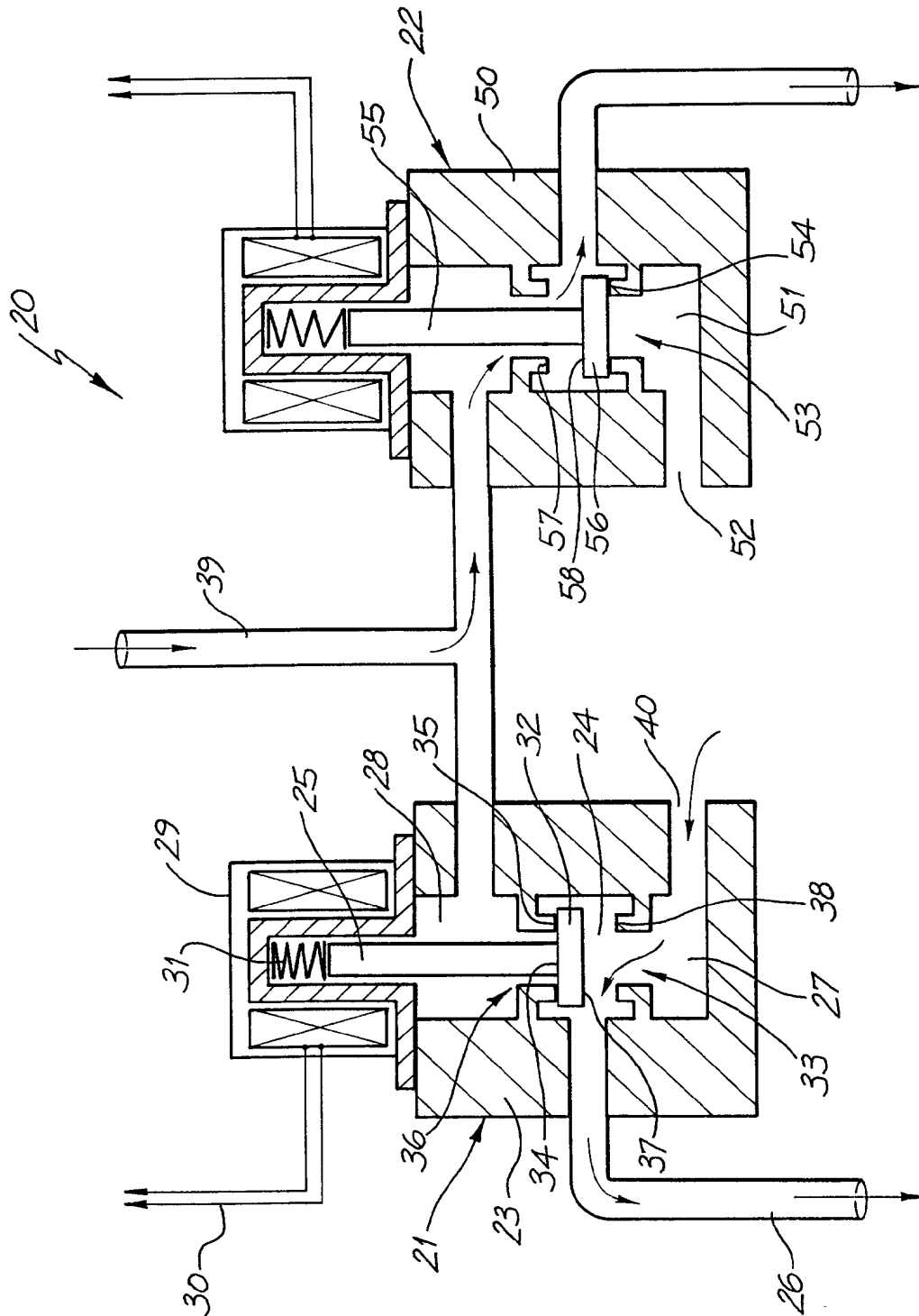


FIG. 2

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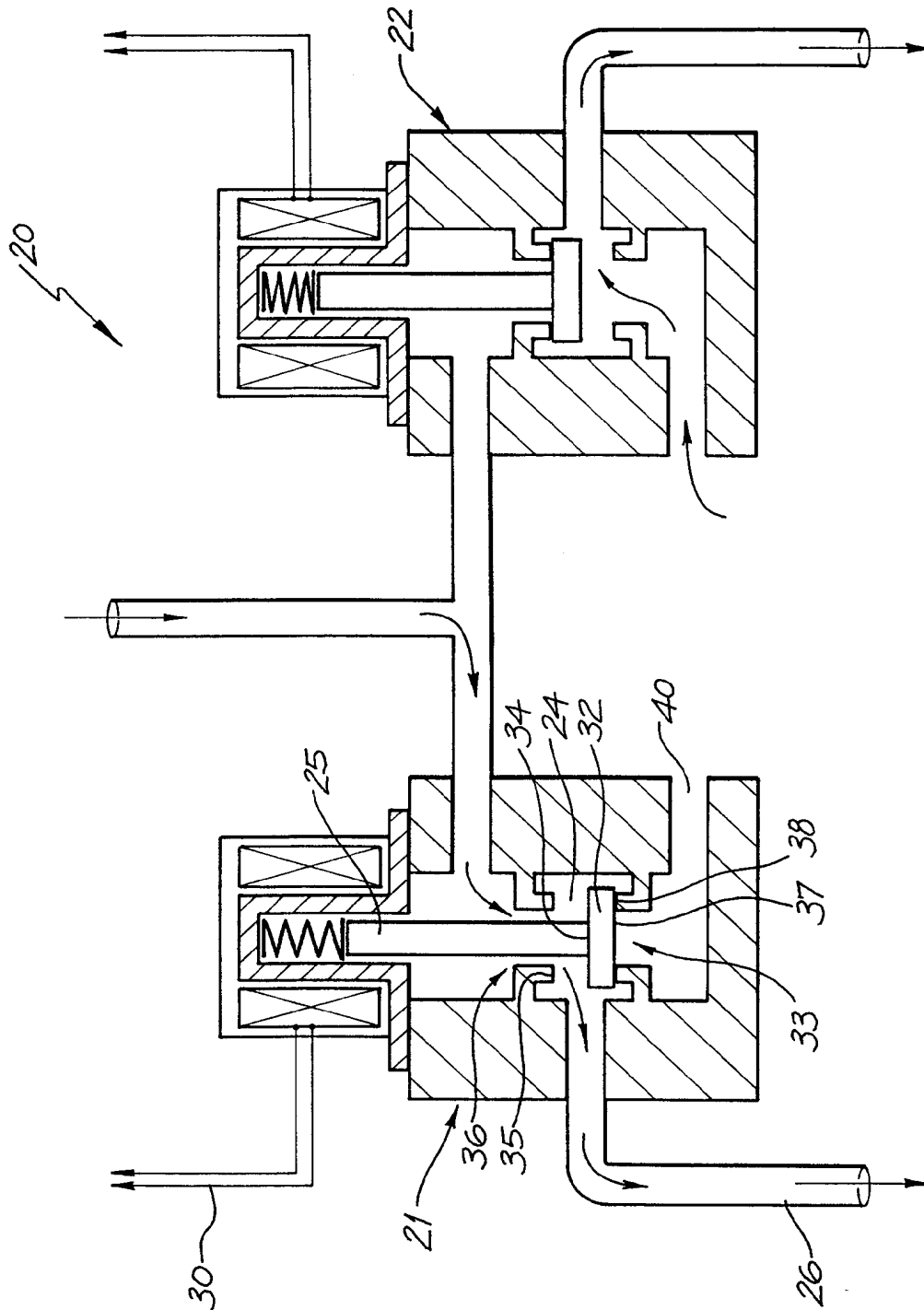


FIG. 3

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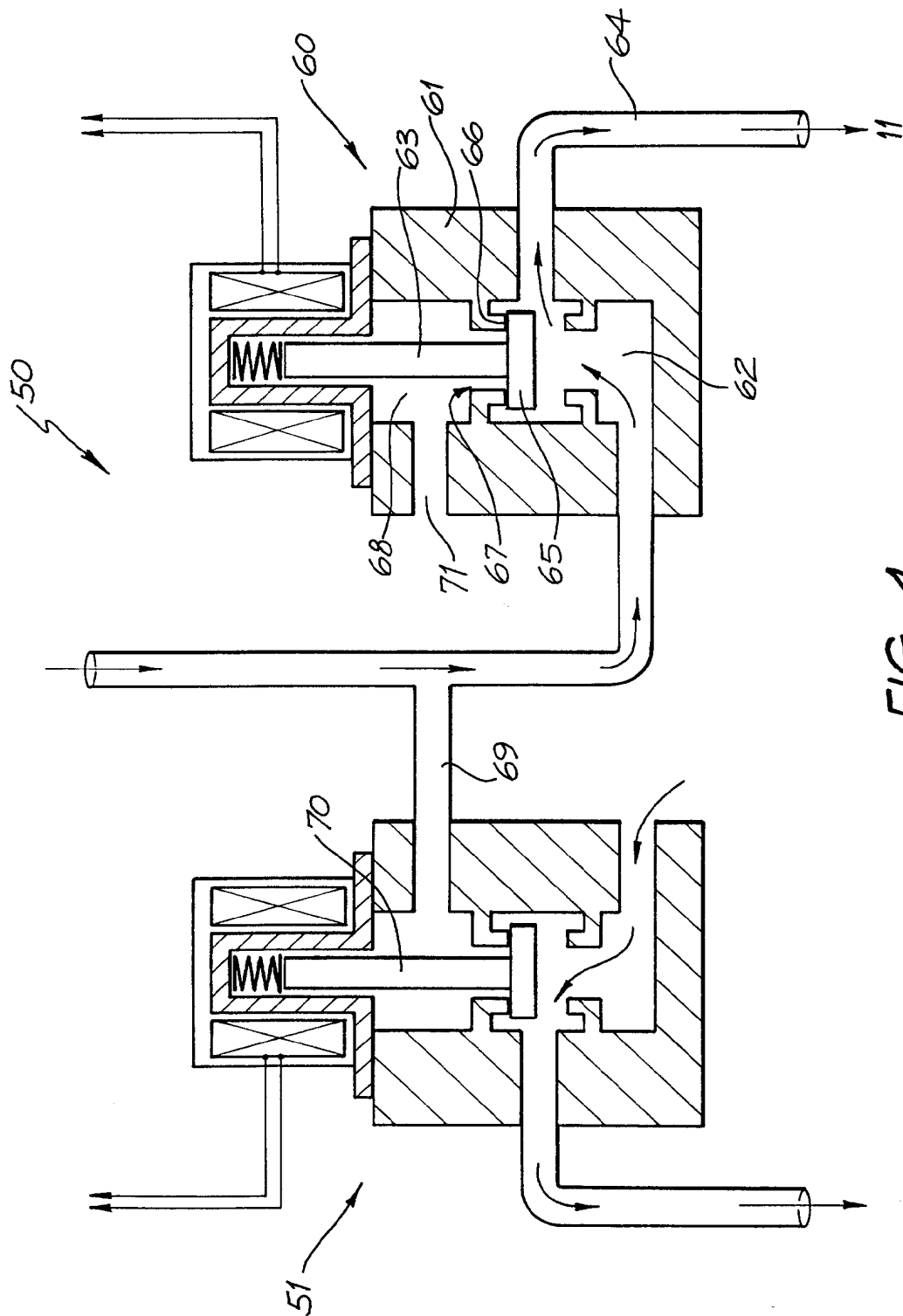


FIG. 4

SUBSTITUTE SHEET (Rule 26)

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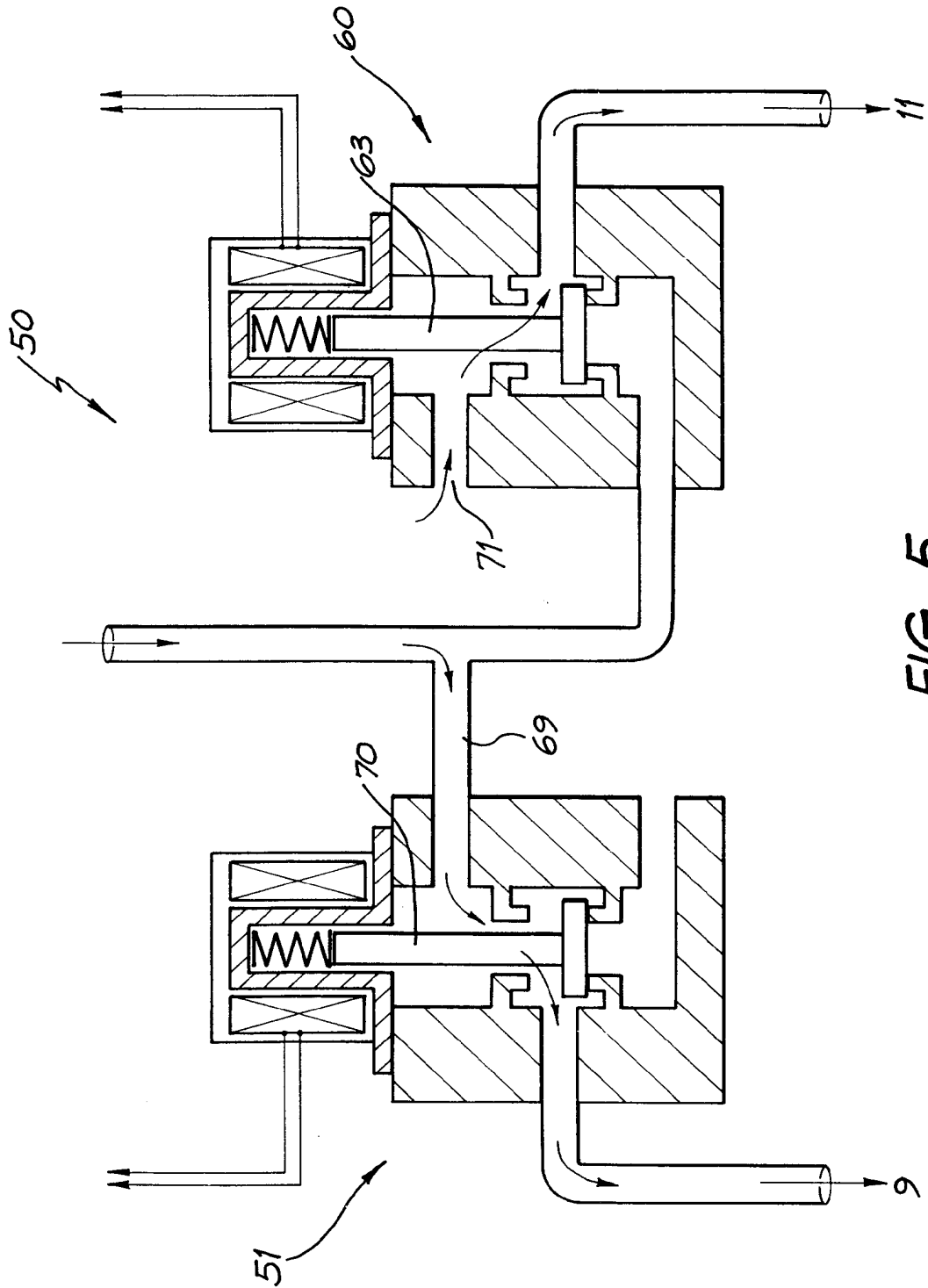
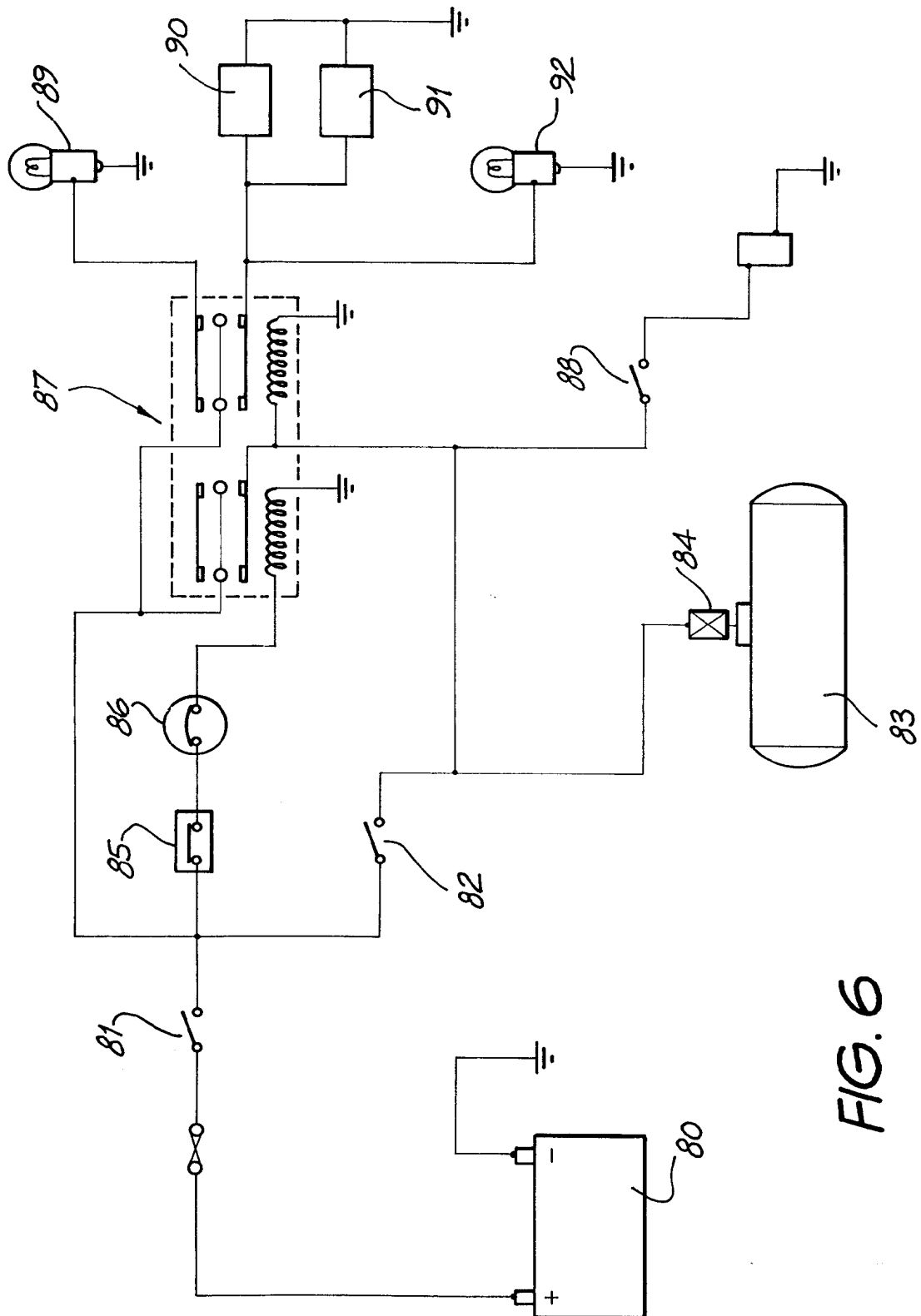


FIG. 5

SUBSTITUTE SHEET (Rule 26)

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SUBSTITUTE SHEET (Rule 26)

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 98/00500

A. CLASSIFICATION OF SUBJECT MATTER																						
Int Cl ⁶ : F02M 43/00; F02D 19/08																						
According to International Patent Classification (IPC) or to both national classification and IPC																						
B. FIELDS SEARCHED																						
Minimum documentation searched (classification system followed by classification symbols) F02M 21/02, 43/00, 02; F02D 19/08, 23/02																						
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU: IPC as above																						
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPAT + keywords																						
C. DOCUMENTS CONSIDERED TO BE RELEVANT																						
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																				
A	US 4619240 A (BEDFORD et al) 28 October 1986 whole document																					
A	US 4517928 A (WOLTERS) 21 May 1985 whole document																					
☐ Further documents are listed in the continuation of Box C ☒ See patent family annex																						
* Special categories of cited documents: <table border="0"> <tr> <td>"A"</td> <td>document defining the general state of the art which is not considered to be of particular relevance</td> <td>"T"</td> <td>later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"E"</td> <td>earlier document but published on or after the international filing date</td> <td>"X"</td> <td>document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"L"</td> <td>document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"Y"</td> <td>document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"O"</td> <td>document referring to an oral disclosure, use, exhibition or other means</td> <td>"&"</td> <td>document member of the same patent family</td> </tr> <tr> <td>"P"</td> <td>document published prior to the international filing date but later than the priority date claimed</td> <td></td> <td></td> </tr> </table>			"A"	document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"E"	earlier document but published on or after the international filing date	"X"	document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family	"P"	document published prior to the international filing date but later than the priority date claimed		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention																			
"E"	earlier document but published on or after the international filing date	"X"	document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone																			
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art																			
"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family																			
"P"	document published prior to the international filing date but later than the priority date claimed																					
Date of the actual completion of the international search 25 August 1998		Date of mailing of the international search report 28 AUG 1998																				
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929		Authorized officer KURT TOBLER Telephone No.: (02) 6283 2469																				

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.
PCT/AU 98/00500

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
US	4619240	CA	1226183	EP	108582		
US	4517928	AU	17878/83	BR	8304334	CA	1213484
		IN	161555	NL	8203169	ZA	8305922
						EP	102119
							END OF ANNEX



(11)

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(12)

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(54) Fuel change-over system and change-over method for motorcycle or motor-assisted bicycle

(57) The invention discloses a fuel change-over system for a motorcycle or motor assisted bicycle. The system comprises a solenoid-actuated gasoline valve (70) for controlling opening/closing of a gasoline supply passage, a solenoid-actuated LPG valve (40) for controlling opening/closing of a LPG supply passage, a gasoline pump (80), a change-over switch (140), a control device (100), and an indication device (150). During a change-over from gasoline to LPG, the control device (100)

makes the pump (80) starting and operating so that any rest gasoline in a carburetor (60) of the vehicle can be drawn by the pump (80) back to a tank (90) of the vehicle. Moreover, the invention provides a fuel change-over method for conducting a smooth fuel change-over between gasoline and LPG in a dual-fuel motorcycle or motor assisted bicycle during its running or stop time. This will be contributive to popularize motorcycles and motor assisted bicycles.

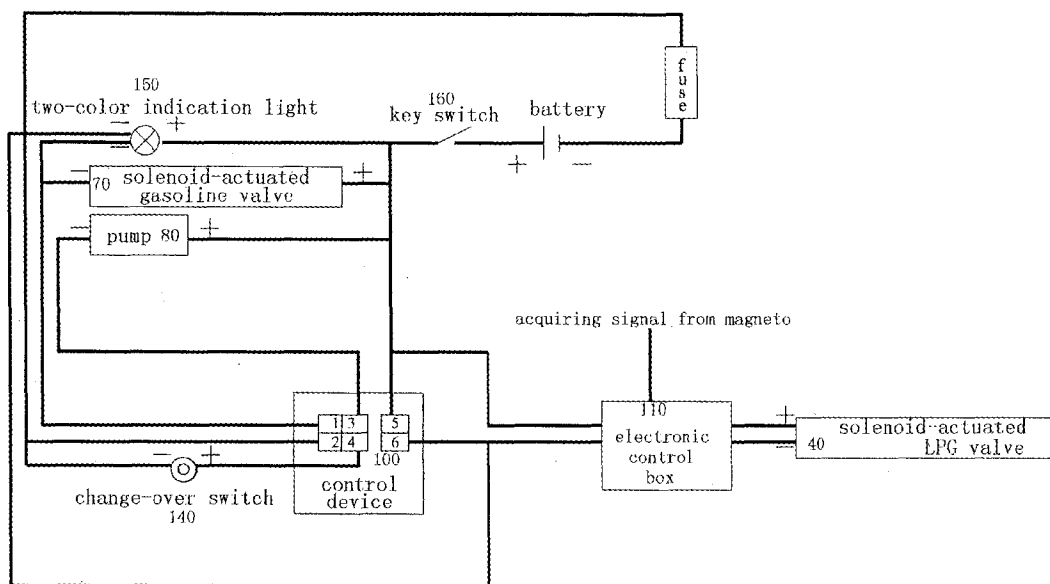


FIG. 2

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Description

Technical field

[0001] The present invention relates generally to a fuel change-over system and a corresponding change-over method thereto for a motorcycle or motor-assisted bicycle (called jointly by motorcycle(s) hereafter).

Background of the invention

[0002] Nowadays, a motorcycle which uses clean energy sources such as LPG is becoming a new popular traffic vehicle, for the emissions of the gasoline-burning motorcycles have polluted the atmosphere heavily. Therefore, a LPG-burning motorcycle is and will be in a great demand in the world market. The gas refilling of LPG motorcycles, however, is a big problem in some countries, which needs the public administrations concerned to invest finance to build sufficient LPG refilling stations and service facilities associated with them. This is a big obstacle for popularizing LPG motorcycles in some countries. If a dual-fuel motorcycle can be developed that uses LPG as a primary fuel and gasoline as a secondary one, the dual-fuel motorcycle of this type will be adopted in large amounts in the cities where there are less LPG refilling stations, it will make its users unnecessary to worry about the trouble in gas refilling, harmful emissions will be reduced, and the environmental atmosphere will be less polluted accordingly. At present, there have existed sophisticated single-fuel motorcycles, that is, gasoline burning ones and LPG burning ones, in wide use. A gasoline-burning motorcycle uses a carburetor to mix fuel with air and to form a combustible mixture, while a LPG-burning motorcycle uses a mixer to mix LPG with air. It is a difficult problem to combine a carburetor and a mixer together in a volume-limited motorcycle body, and it is another difficult problem to make a smooth change-over between the two fuels under a precondition not to influence user's riding. So far, in this field, there has not been a technology capable of solving the problems. Though some technologies for change-over between two fuels have been successfully used in the fields of cars and buses, the difference between a four-wheel vehicle and a two-wheel one is rather great, and most cars and buses are electronically fuel-injected, therefore, there is also a great difference in fuel change-over between a car and a motorcycle.

Summary of the invention

[0003] The object of the invention is to provide a fuel change-over system for conducting smooth and save changing-over between gasoline and LPG in a motorcycle.

[0004] The another object of the invention is to provide a fuel change-over system for conducting smooth and safe changing-over between gasoline and LPG during

user's riding or in stop time.

[0005] The still another object of the invention is to provide a fuel change-over method for conducting smooth and safe changing-over between gasoline and LPG in a motorcycle.

[0006] In one aspect of the invention, the invention provides a fuel change-over system for conducting fuel change-over of a dual-fuel motorcycle. The system is used to conduct changing-over between gasoline supply and LPG supply and comprises: a solenoid-actuated gasoline valve for controlling opening/closing of a gasoline supply passage, it is connected at its one end to a gasoline tank and at its the other end to a carburetor; a solenoid-actuated LPG valve for controlling opening/closing of a LPG supply passage, it is connected at its one end to a LPG source and at its the other end to a mixer, and a outlet of the mixer is connected to a inlet of the carburetor; a change-over switch for conducting changing-over operation. The change-over system further comprises: a pump whose inlet is connected to the carburetor for drawing any rest gasoline in the carburetor back to the gasoline tank; a control device which is electrically connected to the pump, the change-over switch, the solenoid-actuated gasoline valve, and the solenoid-actuated LPG valve, respectively. In changing-over from gasoline to LPG, the control device makes the pump starting so as to draw any rest gasoline in the carburetor back to the gasoline tank.

[0007] In another aspect of the invention, the solenoid-actuated LPG valve is attached on a pressure reducing valve which is connected at its one end to the LPG source and at its the other end to the mixer.

[0008] In still another aspect of the invention, the mixer is connected at its outlet to an inlet of the carburetor and is provided with an air cleaner at its inlet.

[0009] In yet another aspect of the invention, the fuel change-over system is provided with an electronic control box for acquiring a signal from the magneto of a motorcycle. The electronic control box is connected with the solenoid-actuated LPG valve. When the magneto is stopped, the electronic control box transmits a control signal to make the solenoid-actuated LPG valve closed and thereby to shut off LPG supply passage.

[0010] In a further aspect of the invention, the control device further includes a condition memory device which is able to remember if gasoline or LPG is used before electrical power supply is turned off until the motorcycle and its magneto is power on and started again. The change-over switch is a two-position button switch and can be triggered by a voltage signal. The change-over switch is not triggered when the power supply of a motorcycle is turned off.

[0011] In a further aspect of the invention, the fuel change-over system further includes a fuel attribute indicator for indicating if gasoline or LPG is used at that right time. The fuel attribute indicator is electrically connected with the control device.

[0012] In a further aspect of the invention, the control

device can control the gasoline pump so that the operation time length of the pump is proportional to the gasoline chamber volume of the carburetor.

[0013] In a further aspect of the invention, during a changing-over from LPG to gasoline, the control device controls the solenoid-actuated LPG valve so as to make it closed at a time delay; and during a changing-over from gasoline to LPG, the control device controls the solenoid-actuated gasoline valve so as to make it open at a time delay.

[0014] In a further aspect of the invention, the control device is provided with a change-over disabling device which is used to disable any following changing-over operation in a predetermined period after the last changing-over is triggered.

[0015] Furthermore, the invention provides a fuel change-over method for conducting fuel change-over in a dual-fuel motorcycle. The method comprises: during a changing-over from LPG to gasoline, as soon as the change-over switch of the change-over system is operated, the control device of the change-over system makes the solenoid-actuated gasoline valve open immediately so as to make gasoline passage through, and at the same time, the solenoid-actuated LPG valve is closed at a time delay; during a changing-over from gasoline to LPG, as soon as the change-over switch of the change-over system is operated, the control device of the change-over system makes the solenoid-actuated gasoline valve closed immediately so as to shut off gasoline passage, and at the same time, the gasoline pump in the fuel change-over system is started, and the solenoid-actuated LPG valve is opened at a time delay.

[0016] With the fuel change-over system and the fuel change-over method according to the invention, a rider can conduct a smooth fuel changing-over between gasoline and LPG during whose running or in stop time. This will be contributive to popularize motorcycles.

Brief description of drawings

[0017]

Fig. 1 is a schematic diagram of a general layout of the fuel change-over system according to the invention; and

Fig. 2 is a wiring principle diagram of the control device of the fuel change-over system according to the invention.

Detailed description of the invention

[0018] The invention is described below in detail in reference to the accompanying drawings.

[0019] Fig. 1 is a schematic diagram of a general layout of the fuel change-over system for a motorcycle according to the invention, which is used for conducting changing-over between gasoline and LPG. The fuel change-over system comprises a solenoid-actuated gasoline

valve 70 for opening/closing a gasoline supply passage and a solenoid-actuated LPG valve 40 for opening/closing a LPG supply passage. The solenoid-actuated gasoline valve 70 is connected at its one end to a gasoline tank 90 and at its the other end to a carburetor 60. The solenoid-actuated LPG valve 40 is attached on a pressure-reducing valve 120 which is used for adjusting LPG pressure into a mixer 50. The pressure-reducing valve 120 is connected at its one end to a LPG container 20 and at its other end to the mixer 50 which is used for mixing LPG and air. An outlet of the mixer 50 is connected to an inlet of the carburetor 60, and thereby it is possible to use a common fuel throttle wire, and an air cleaner (not shown) is provided at an inlet of the mixer 50. As shown in Fig. 1, a combination valve 30 is provided in the LPG container 20 and is connected to a LPG refilling valve 10 which is used for filling LPG into LPG container 20.

[0020] The fuel change-over system comprises a change-over switch for triggering a changing-over operation. Preferably, the change-over switch is a two-position button switch and can be triggered by a voltage signal. Thus, the change-over switch will not be triggered by a mal-operation in the case that the main power supply is turned off.

[0021] The fuel change-over system of the invention further comprises a gasoline pump 80 which is connected at its inlet to a discharge port at the bottom of the carburetor 60 and at its outlet to a gasoline tank 90 so that it can draw any rest gasoline in the carburetor 60 back to the gasoline tank 90.

[0022] Furthermore, the fuel change-over system includes a control device 100. As shown in Fig. 2, the control device 100 has six control legs, wherein leg 1 is connected to the solenoid-actuated gasoline valve 70 and can be connected in parallel with a double-color indication light 150 for indicating the condition of the solenoid-actuated gasoline valve 70, e.g. red light's lighting up indicates that the solenoid-actuated gasoline valve 70 is open and gasoline is used; leg 6 is connected to solenoid-actuated LPG valve 40 and also connected with the double-color indication light 150 for indicating the condition of the solenoid-actuated LPG valve 40, e.g. green light's lighting up indicates that the solenoid-actuated LPG valve 40 is open and LPG is used; leg 2 is connected to the negative of the battery; leg 3 to gasoline pump 80; leg 4 to the change-over switch 140; and leg 5 to the key switch 160 of a motorcycle.

[0023] The control device 100 carries out its control functions as follows: in a changing over from LPG to gasoline, as soon as the change-over switch 140 is pressed down, the control device 100 makes solenoid-actuated gasoline valve 70 open immediately so that the gasoline supply passage becomes through; meanwhile the solenoid-actuated LPG valve 40 on the pressure-reducing valve 120 is closed at a time delay and the LPG supply passage is closed at a time delay accordingly. The double-color indication light 150 gives out a red light

in the time a motorcycle runs on gasoline. In a changing over from gasoline to LPG, as soon as the change-over switch 140 is pressed again, the control device 100 makes solenoid-actuated gasoline valve 70 closed immediately so that the gasoline supply passage shut off, and the pump 80 is put into operation for a suitable predetermined period to draw any rest gasoline in the carburetor 60 back to the gasoline tank 90 and then is stopped; meanwhile the solenoid-actuated LPG valve 40 on the pressure-reducing valve 120 is opened at a time delay and the LPG supply passage becomes through accordingly. The double-color indication light 150 gives out a green light in the time a motorcycle runs on gasoline.

[0024] In the control process described above, the length of the time delay at which the solenoid-actuated LPG valve 40 is closed or opened is dependent on the displacement volume of a specific motorcycle and on the internal configuration of the carburetor 60; the length of the period for which the gasoline pump 80 works is dependent on the size of the carburetor gasoline chamber. Generally, the larger the gasoline chamber is the longer the period for which the gasoline pump 80 shall work after the solenoid-actuated gasoline valve 70 is closed.

[0025] Preferably, the control device 100 further includes a condition memory device which is able to remember the condition in which if gasoline or LPG is used before electrical power supply is turned off until power supply is turned on again, thereby, when the motorcycle is restarted, the control device 100 can hold the motorcycle to use the fuel that was used before its electrical power supply is turned off. In the case that the change-over switch 140 is a voltage triggered button-type switch, in combination with the condition memory device, a program malfunction or mal-operation which may cause the two fuel burned simultaneously can be avoided.

[0026] Furthermore, the control system 100 includes a change-over disabling device which is used to disable any following changing-over operation in a predetermined period (e.g. 10 seconds) after the change-over switch 140 is pressed down last-time, this is to ensure that two successive fuel change-overs can not be conducted in a stipulated time length so as to avoid the program out of order and the two fuels burned simultaneously.

[0027] Moreover, in order to ensure motorcycle's stability and safety, the control device 100 of the fuel change-over system of the invention is provided with an electronic control box 110 for acquiring a signal from a magneto of the motorcycle. The electronic control box 110 is connected with the solenoid-actuated LPG valve 40. As soon as the motorcycle stops traveling and its magneto stops as well, the electronic control box 110 transmits a control signal to make the solenoid-actuated LPG valve 40 closed so as to shut off LPG passage.

[0028] In addition, as shown in Fig. 1, an additional solenoid-actuated LPG valve 130 is provided in the container which is LPG source. The valve, together and at the same time with the solenoid-actuated LPG valve 40

attached on the pressure-reducing valve 120, is controlled by the control device 100. This is advantageous to raise the safety of the whole system.

[0029] While the preferred embodiment of the invention has been described and illustrated, it is obvious that those who are skillful in this technical field can make many changes and modifications without departing from the spirit and principle of the invention. For example, the fuel change-over system according to the invention can be modified to suit motorcycles of different displacements and carburetors of different sizes by adjusting the time delay of the solenoid-actuated LPG valve 40 in the system. Therefore, the scope of the invention is only defined by the claims.

Claims

1. A fuel change-over system which is used on a dual-fuel motorcycle or motor assisted bicycle for conducting its fuel change-over, more particularly for conducting change-over between gasoline supply and LPG supply, is **characterized in that** the fuel change-over system comprises:

a solenoid-actuated gasoline valve for controlling opening/closing of a gasoline supply passage, the solenoid-actuated gasoline valve being connected at its one end to a gasoline tank and at its the other end to a carburetor;
a solenoid-actuated LPG valve for controlling opening/closing of a LPG supply passage, the solenoid-actuated LPG valve being connected at its one end to a LPG source and at its the other end to a mixer;
a change-over switch for conducting changing-over operation;
a gasoline pump which is connected at its inlet to the carburetor and at its outlet to the gasoline tank so that the pump can draw the gasoline in the carburetor back to the tank;
a control device which is electrically connected to the pump, the change-over switch, the solenoid-actuated gasoline valve, and the solenoid-actuated LPG valve, respectively, the control device is configured to start the pump to draw the gasoline in the carburetor back to the tank as soon as the change-over switch is triggered when a changing-over from gasoline to LPG is conducted.

2. The fuel change-over system according to claim 1, wherein the solenoid-actuated LPG valve is attached on a pressure-reducing valve, and the pressure-reducing valve is connected at its one end to the LPG source and at its the other end to the mixer.
3. The fuel change-over system according to claim 1,

wherein the mixer is connected at its outlet to an inlet of the carburetor and is provided with an air cleaner at its inlet.

4. The fuel change-over system according to claim 1, wherein the fuel change-over system is provided with an electronic control box for acquiring a signal from a magneto of a motorcycle and motor assisted bicycle, the electronic control box is connected with the solenoid-actuated LPG valve, the electronic control box transmits a control signal to make the solenoid-actuated LPG valve closed and thereby to shut off LPG passage as soon as the magneto stops. 5
5. The fuel change-over system according to claim 1, wherein further comprising a condition memory device which is able to remember the condition in which if gasoline or LPG is used before the electrical power supply of the control device is turned off until the power supply is turned on again, thereby, when the motorcycle or motor assisted bicycle is restarted, the control device can hold it to use the fuel that was used before its electrical power supply is turned off, the change-over switch is a voltage triggered button-type switch, which is not triggered when the electrical power supply of the motorcycle or motor assisted bicycle is turned off. 15 20 25
6. The fuel change-over system according to claim 1, wherein the fuel change-over system comprises a fuel attribute indicator for indicating if gasoline or LPG is used by the vehicle at that right time, the indicator is connected with the control device. 30
7. The fuel change-over system according to claim 1, wherein the control device can control the gasoline pump so that the length of its operation time is proportional to the gasoline chamber volume of the carburetor. 35 40
8. The fuel change-over system according to claim 1, wherein during a changing-over from LPG to gasoline, the control device controls the solenoid-actuated LPG valve so as to make it closed at a time delay; and during a changing-over from gasoline to LPG, the control device controls the solenoid-actuated gasoline valve so as to make it open at a time delay. 45
9. The fuel change-over system according to claim 1, wherein the fuel change-over system includes a change-over disabling device which is used to disable any following changing-over operation in a predetermined period after the last-time change-over is carried out. 50 55
10. A fuel change-over method for conducting fuel change-over of a dual-fuel motorcycle or motor assisted bicycle via a fuel change-over system, com-

prising:

during a changing-over from LPG to gasoline, as soon as a change-over switch of the change-over system is operated, a control device of the change-over system makes a solenoid-actuated gasoline valve thereof open immediately so as to make gasoline supply passage through, and at the same time, a solenoid-actuated LPG valve thereof is closed at a time delay; during a changing-over from gasoline to LPG, as soon as the change-over switch of the change-over system is operated, the control device of the change-over system makes the solenoid-actuated gasoline valve closed immediately so as to shut off the gasoline supply passage, and at the same time, the gasoline pump in the fuel change-over system is started to work and the solenoid-actuated LPG valve is opened at a time delay.

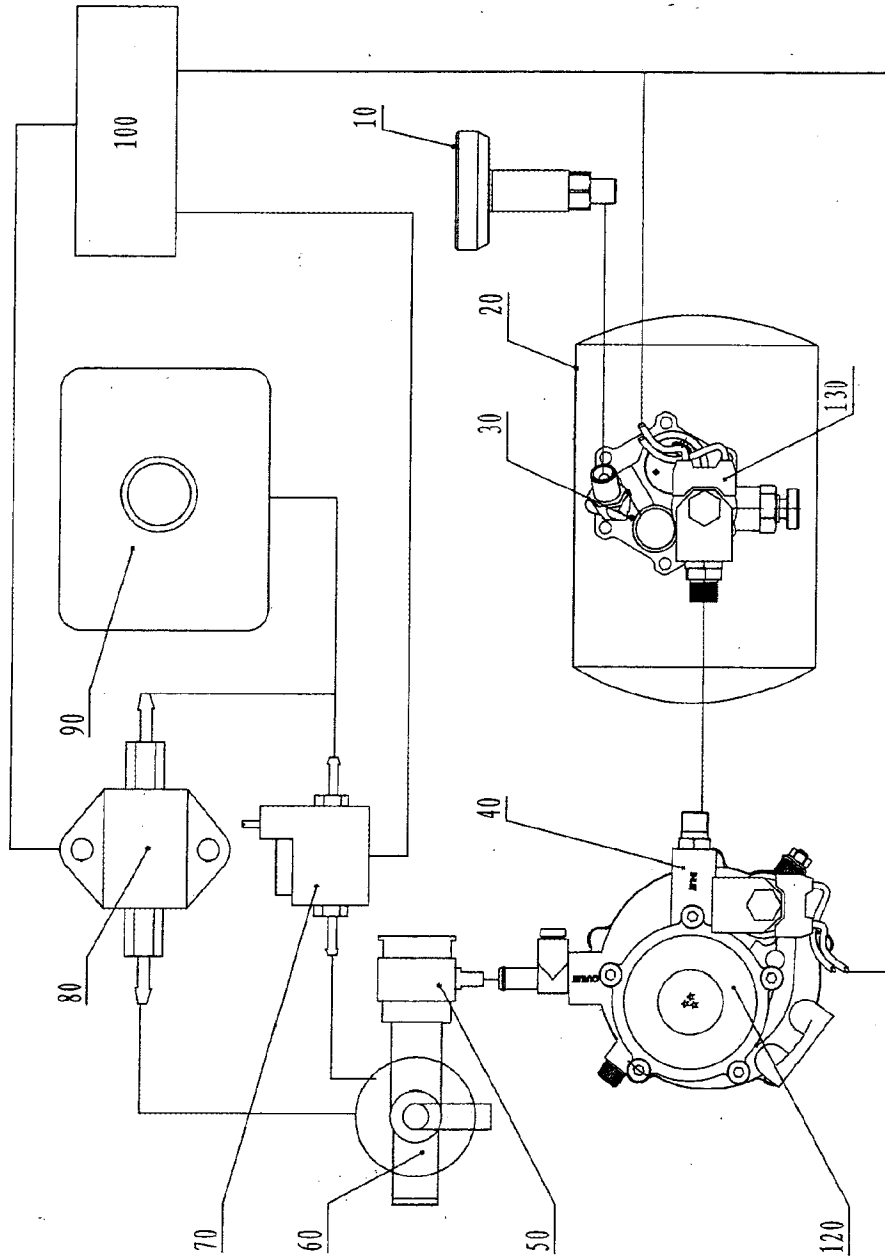


FIG. 1

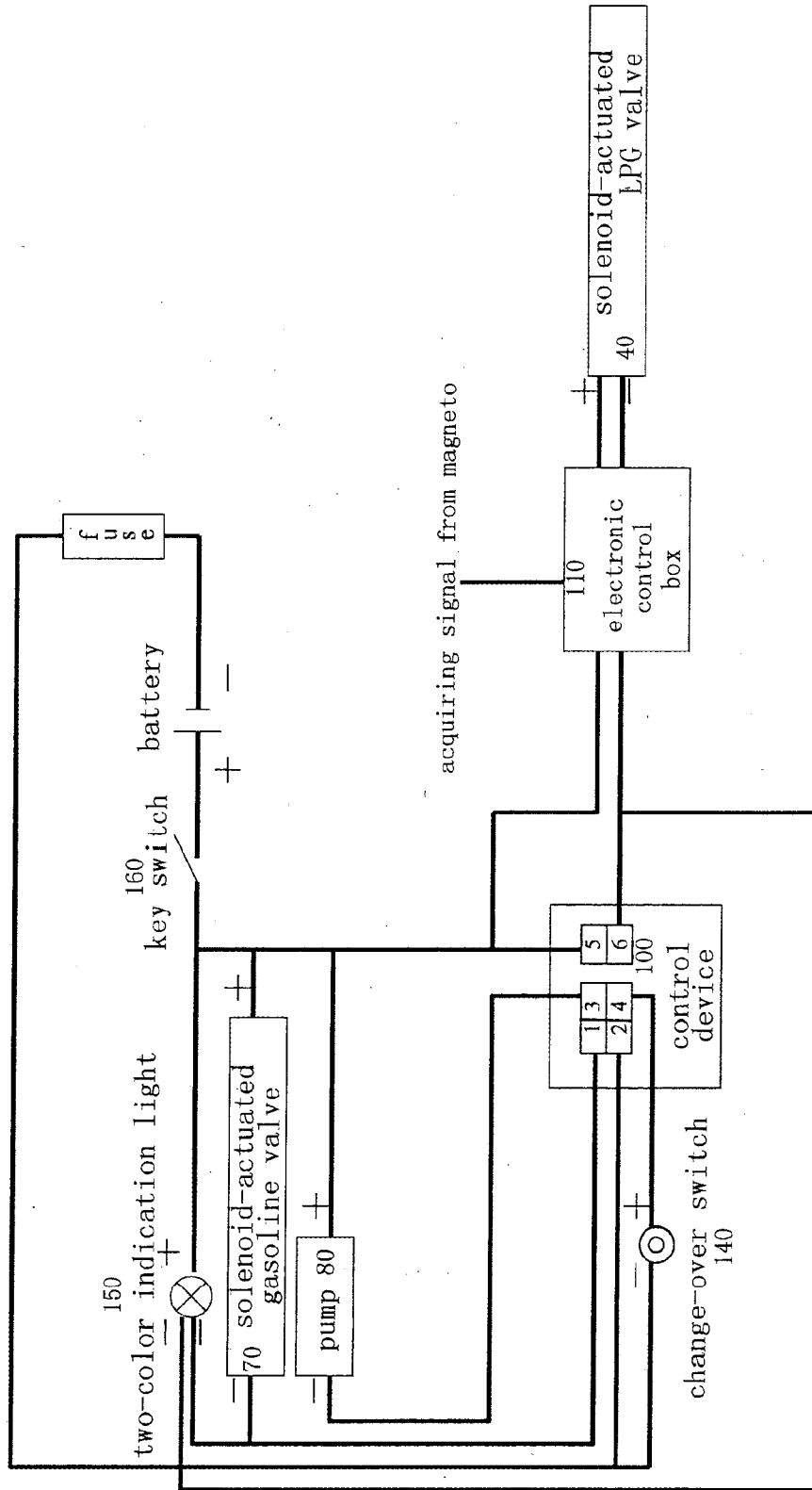


FIG. 2



Espacenet

Bibliographic data: FR2220679 (A1) — 1974-10-04

Fuel control system for I.C. engine - supplies light or heavy fuel, according to use of engine, to injection pump

Inventor(s):

Applicant(s): SERVEQUIP [FR] ± (SERVEQUIP,FR, ; SERVEQUIP)

Classification: - **international:** *F02D19/06*; (IPC1-7): F02D19/06
- **cooperative:** F02D19/0618 (EP); F02D19/0676 (EP);
Y02T10/30 (EP)

Application number: FR19730008061 19730307

Priority number(s): FR19730008061 19730307

Also published as: FR2220679 (B1).

Abstract of FR2220679 (A1)

The engine fuel pump is supplied from either of two fuel tanks through an electromagnetic three-way valve. Excess fuel from the pump is returned to either tank through another three way valve. The valve motors are energised by a circuit containing a switch controlled by a manual lever. The flow valve is operated immediately by the controls but the return valve is operated through an adjustable delay timer. This ensures that fuel already in the pipes is returned to the correct tank.

DEMANDE DE BREVET D'INVENTION

1^{re} PUBLICATION

22 Date de dépôt 7 mars 1973, à 14 h 14 mn.

41 Date de la mise à la disposition du
public de la demande..... B.O.P.I. — «Listes» n. 40 du 4-10-1974.

51 Classification internationale (Int. Cl.) F 02 d 19/06.

71 Déposant : Société anonyme dite : SERVEQUIP, résidant en France.

73 Titulaire : *Idem* 71

74 Mandataire : Cabinet Faber.

54 Installation de contrôle de l'alimentation d'un moteur sélectivement en gas-oil et en fuel-oil.

72 Invention de :

33 32 31 Priorité conventionnelle :

L'invention concerne le contrôle de l'alimentation d'un moteur à combustion interne sélectivement en gas-oil et en fuel-oil, notamment les moteurs de pompes à béton montées sur véhicules automobiles.

5 Lorsqu'une pompe à béton est installée d'une manière immobile sur un chantier, il est autorisé de l'actionner au moyen d'un moteur alimenté en fuel-oil, c'est-à-dire, un carburant détaxé et par conséquent bon marché. Mais lorsque cette même pompe est montée sur un véhicule automobile, il n'est pas
10 permis que le moteur d'entraînement de ce véhicule soit alimenté également en fuel-oil, on l'alimente donc en général en gas-oil, c'est-à-dire en carburant non détaxé, et par conséquent onéreux.

 En moyenne, on a constaté que les temps d'utilisation
15 d'une pompe à béton se partagent approximativement en 3/5 pour le travail de pompage du béton à poste fixe et 2/5 pour les déplacements de la pompe.

 Au lieu d'avoir un moteur alimenté à partir d'un réservoir de fuel-oil pour l'actionnement de la pompe et un autre
20 moteur alimenté à partir d'un réservoir de gas-oil pour l'entraînement du véhicule, il serait intéressant d'avoir un moteur unique que l'on puisse accoupler sélectivement à la pompe ou à la transmission d'entraînement des roues du véhicule pourvu que l'on soit assuré que l'alimentation du moteur se fasse dans
25 chacune des deux utilisations, à partir du réservoir de carburant correspondant et qu'au début du fonctionnement au gas-oil le reliquat de fuel-oil demeuré dans les diverses tuyauteries et accessoires, tels que filtres et injecteurs, retourne bien dans le réservoir de fuel-oil.

30 A cet effet, on va donc utiliser une installation de contrôle de l'alimentation d'une pompe à injection d'un moteur unique sélectivement à partir d'un réservoir de gas-oil ou d'un réservoir de fuel-oil, selon que le moteur est accouplé à un premier ou à un second appareil d'utilisation, notamment d'un
35 moteur de pompe à béton montée sur un véhicule automobile mû par le même moteur, accouplé sélectivement à la pompe ou à une transmission d'entraînement des roues motrices du véhicule par un embrayage sélectif à commande manuelle et, suivant l'invention, l'entrée de la pompe d'alimentation du moteur est reliée

aux deux réservoirs de carburant par l'intermédiaire d'une première électro-valve d'amenée à trois voies et la sortie de ladite pompe est reliée semblablement aux deux réservoirs de carburant par l'intermédiaire d'une seconde électro-valve de retour à trois voies, les deux électro-valves étant placées sous le contrôle de l'organe de commande manuelle de l'embrayage sélectif du moteur, la première directement et la seconde par l'intermédiaire d'un relais temporisé, de façon telle que le retour de fuel-oil se fasse vers le réservoir de fuel-oil, non seulement lorsque l'alimentation de la pompe du moteur est assurée en fuel-oil, mais aussi pendant la durée de la temporisation dudit relais au début de l'alimentation de la pompe du moteur en gas-oil.

Grâce à une telle installation, le fait même d'accoupler le moteur à la pompe à béton ou bien à la transmission d'entraînement des roues du véhicule assure automatiquement l'alimentation de la pompe à injection du moteur à partir du réservoir de carburant approprié et, de plus, le reliquat de fuel-oil demeuré dans les conduites et accessoires ne risque pas de retourner dans le réservoir de gas-oil pendant le début du fonctionnement du moteur au gas-oil.

L'invention sera mieux comprise à la lecture de la description qui va suivre et à l'examen du dessin annexé dont la figure unique est un schéma d'une installation de contrôle de l'alimentation d'un moteur de pompe à béton suivant l'invention.

Sur le schéma, on a indiqué en 1 un moteur qui peut être accouplé, sélectivement, à une pompe à béton et aux roues d'un véhicule sur lequel est montée ladite pompe, au moyen d'un embrayage sélectif placé sous le contrôle d'un levier à commande manuelle 2 que l'on peut placer, sélectivement, dans l'une ou l'autre de deux positions correspondantes désignées respectivement par 2C et 2R sur le schéma, à savoir une position "chantier" pour l'entraînement de la pompe et une position "route" pour les déplacements.

Lorsque le moteur 1 est accouplé à la pompe à béton, sa pompe à injection 4 est alimentée à partir d'un réservoir 5 de fuel-oil par l'intermédiaire d'une électro-valve d'amenée à trois voies 6, dans sa position de repos, le levier 2 de sélection étant dans la position 2C. Lorsque le moteur 1 est accou-

plé aux roues du véhicule par la mise en position du levier de sélection 2 dans la position 2R, la pompe à injection 4 du moteur est alimentée à partir d'un autre réservoir 7 de gas-oil, par l'intermédiaire de la même électro-valve 6 en position de travail.

5 L'électro-valve est donc reliée d'une part, à l'entrée de la pompe à injection 4 par une conduite 11 et, d'autre part, aux deux réservoirs de carburant 5 et 7 par deux conduites 13 et 14, respectivement.

La sortie de la pompe à injection 4 est reliée par une
10 conduite 16 à une électro-valve de retour 17 qui est reliée, à son tour, aussi aux deux réservoirs de carburant 5 et 7 par deux conduites 18 et 19 respectivement.

Dans sa position de repos l'électro-valve de retour 17 met la sortie de la pompe à injection 4 en communication avec le
15 réservoir de fuel-oil 5, tandis que lorsqu'elle est excitée elle la met en communication avec le réservoir de gas-oil 7.

Les deux électro-valves 6 et 17 sont alimentées à partir d'une source de courant appropriée, telle qu'une batterie d'accumulateurs 21, par l'intermédiaire d'un interrupteur 22 fermé
20 lorsque le levier de sélection 2 est dans la position 2R de déplacement du véhicule, de préférence sous le contrôle du contact 24 de marche du moteur 1, muni d'un témoin lumineux 25. Toutefois, l'alimentation de l'électro-valve d'amenée 6 se fait directement à partir de l'interrupteur 22, tandis que celle de
25 l'électro-valve de retour 17 se fait par l'intermédiaire d'un relais 26 temporisé par exemple pour une durée de deux minutes. On peut avantageusement utiliser à cet effet, un relais à temporisation réglable par exemple de 0 à 180 secondes.

Le fonctionnement de l'installation est le suivant :
30 pour faire fonctionner la pompe à béton, on place le levier sélecteur 2 dans la position "chantier" 2C. Le contact 24 étant fermé, le moteur 1 en fonctionnement entraîne par conséquent la pompe à béton et sa pompe à injection 4 est alimentée en fuel-oil bon marché à partir du réservoir 5 par la conduite
35 13, l'électro-valve d'amenée 6 au repos et la conduite 11. Le retour de carburant de la pompe à injection 4 se fait par la conduite 16, l'électro-valve de retour 17 en position de repos et la conduite 18.

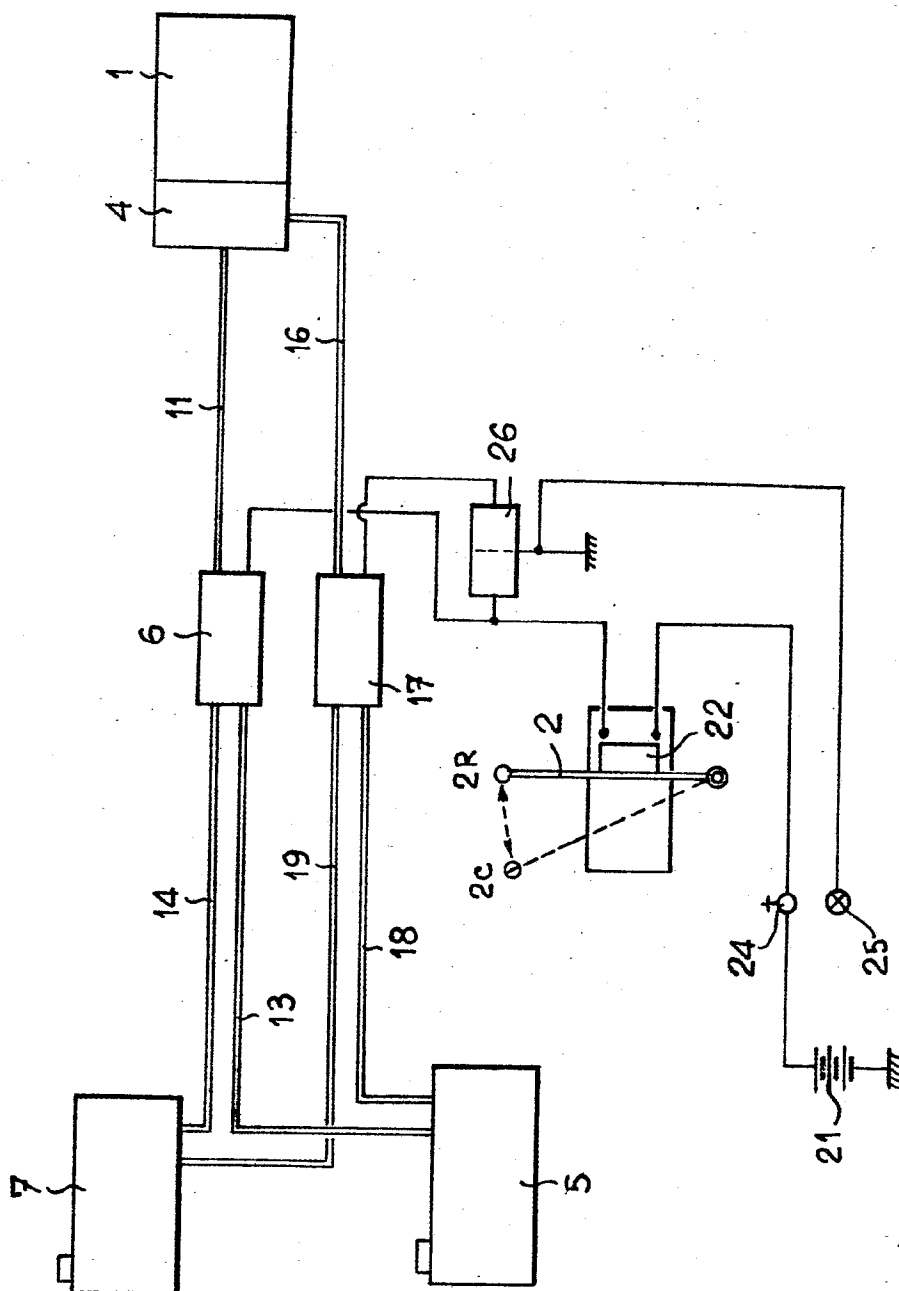
Si l'on a besoin de déplacer la pompe à béton, on doit

amener le levier sélecteur 2 dans la position "route" 2R de manière à assurer l'accouplement du moteur 1 aux roues du véhicule. Dans cette position, l'électro-valve d'amenée 6 est immédiatement mise en position de travail et la pompe à injection 4 du moteur 5 est alimentée en gas-oil cher par la conduite 14, l'électro-valve d'amenée 6 en position de travail, et la conduite 11. Dès le début du fonctionnement du moteur dans cette condition, le relais temporisé 26, bien qu'alimenté aussi, laisse encore, pendant une durée d'environ deux minutes l'électro-valve de retour 17 en position de repos, de sorte que le reliquat du carburant précédemment utilisé, c'est-à-dire du fuel-oil bon marché qui se trouvait encore dans les conduites et accessoires retourne par la conduite 16, l'électro-valve 17 de retour au repos et la conduite 18, au réservoir 5 de fuel-oil. A l'expiration du temps de 15 temporisation, on est certain que tout le circuit de retour est purgé de fuel-oil bon marché et, à ce moment, le relais 26 assure la mise de l'électro-valve de retour 17 en position de travail pour permettre le retour de gas-oil de la pompe à injection, par la conduite 19, au réservoir 7 de gas-oil cher.

20 Bien entendu, l'invention n'est pas limitée au mode de réalisation décrit et représenté ; on peut y apporter des modifications, suivant les applications envisagées, sans sortir, pour cela, du cadre de l'invention.

R E V E N D I C A T I O N

Installation de contrôle de l'alimentation d'une pompe à injection de moteur sélectivement à partir d'un réservoir de gas-oil ou d'un réservoir de fuel-oil, selon que le moteur est accouplé à un premier ou à un second appareil d'utilisation, notamment d'un moteur de pompe à béton monté sur un véhicule automobile mû par le même moteur, accouplé sélectivement à la pompe ou à une transmission d'entraînement des roues motrices du véhicule par un embrayage sélectif à commande manuelle, ladite installation étant caractérisée en ce que l'entrée de la pompe d'alimentation du moteur est reliée aux deux réservoirs de carburant par l'intermédiaire d'une électro-valve d'amenée à trois voies et la sortie de ladite pompe est reliée semblablement aux deux réservoirs de carburant par l'intermédiaire d'une électro-valve de retour à trois voies également, les deux électro-valves étant placées sous le contrôle de l'organe de commande manuelle de l'embrayage sélectif du moteur, la première directement et la seconde par l'intermédiaire d'un relais temporisé, de façon telle que le retour de fuel-oil se fasse vers le réservoir de fuel-oil, non seulement lorsque l'alimentation de la pompe du moteur est assurée en fuel-oil, mais aussi pendant la durée de la temporisation dudit relais au début de l'alimentation de la pompe du moteur en gas-oil.





ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
16/191,503

RECEIPT DATE / TIME
08/11/2022 11:00:14 AM ET

ATTORNEY DOCKET #
CET1090.070

Title of Invention

DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 6187

FILED BY Robyn Templin

PATENT CENTER # 60863142

FILING DATE 11/15/2018

CUSTOMER # 26629

FIRST NAMED INVENTOR Mark J. Sarder

CORRESPONDENCE ADDRESS -

AUTHORIZED BY Andrew Stark

Documents

TOTAL DOCUMENTS: 12

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
2022.08.11 Response to Decision on Appeal.pdf		7	-	125 KB
2022.08.11 Response to Decision on Appeal-BD.A.pdf	(1-1)	1	Amendment/Argument after Patent Board Decision	111 KB
2022.08.11 Response to Decision on Appeal-CLM.pdf	(2-5)	4	Claims	86 KB
2022.08.11 Response to Decision on Appeal-REM.pdf	(6-7)	2	Applicant Arguments/Remarks Made in an Amendment	82 KB

2022.08.11 Terminal Disclaimer.pdf	1	Terminal Disclaimer Filed	90 KB
2022.08.11 Supp IDS.pdf	5	Information Disclosure Statement (IDS) Form (SB08)	985 KB
FPD1-EP1826377A2.pdf	7	Foreign Reference	3583 KB
FPD2-FR2510660A1.pdf	9	Foreign Reference	959 KB
FPD3-JPH0466743A.pdf	5	Foreign Reference	704 KB
FPD4-WO1999001659A1.pdf	31	Foreign Reference	1262 KB
FPD5-WO2007048633A1.pdf	45	Foreign Reference	404 KB
FPD6-FR2220679A1.pdf	8	Foreign Reference	931 KB
NPL1-Yamaha EF2000iS Tri Fuel Conversion Overview and Installation Tips.pdf	9	Non Patent Literature	669 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
2022.08.11 Response to Decision on Appeal.pdf	04AA5E630558005608A227C395834D07B3297460CC1D6AEB83 BCE725217770EA63334BF24B25C5D38FE17B4249DF48995498 7F8F8BB436DFCA6BA534AFA6B587
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2022.08.11 Response to Decision on Appeal-CLM.pdf	7661766D3717C181FB84D0782E13CA82CAF3895799530765C3 518B2D05C5F913693E234994D361F6E9C6575AAB050058A731 810F6E14AF3E0E2660BF653EF9A7

2022.08.11 Response to Decision on Appeal-REM.pdf	4CC7C23D24748968C858C761E9A22B4CDA990148F234795959 51D6BA2D5A78891B477CD870542D86A52EEB53115968038AE 45A0871F228AA136420C55D78B1FE
2022.08.11 Terminal Disclaimer.pdf	3BE87FDE3469A7AB517EC4D79F23E5E9ED1503B190E271AC C34514F2718C7F23CF950EA8791A5CACAA76ADF7B38EAE7F DF66082C132A40A2F54E2EE446ED555A
2022.08.11 Supp IDS.pdf	E58F9271747EA4289BB3ACD2010BE7CE522A3A89C514167DD CE38BD2BFA179DD9024907E48C4B8FF46ACDC06708D16A8C CC52D8FD553F55D2063054D8BB55235
FPD1-EP1826377A2.pdf	5519381BE2F1669C49C52F6A3CE1C2AE9B98CCE1B2B1E8765 51AA609DC03A3CE43A83C43D84723A8A2E3E083CDC6BF981 28612A6F8ED6D2C1EEB04F5B2D0A7C5
FPD2-FR2510660A1.pdf	03FEC57227ECDA0C648512D8BF9FCC432B6CD55D6DF2E27C F80DEFB471CD6F60E911D2B30A6BBB99CDE1F29AE34F593C B374C61DA89AB1377DF6FFF300494476
FPD3-JPH0466743A.pdf	C6E209FA97CF27D3D32C54AE2DB66E095D80B7D91772B8D6 F8390DDD77A5FB9F90DC7BB8BB85C93B009011F08D0EC5166 77D12E2873170C615AC4B61C35B23F1
FPD4-WO1999001659A1.pdf	DF420B5442995B60703A46ED0E5A2786B45B74A458008DEF00 31FA4637C31BF5CB2D9BF225A961C81DE6EC3D5AF0113914E 986E2257860ED5B882C472BE4291B
FPD5-WO2007048633A1.pdf	354BA9FBE6516DEDC0B41922D3EBE31F7459E1E4D1637EAE A7CBFEAEFF0BADF96EFD87B0641C58D57011F7782A90FE529 6539526BC9E7B2CBB32A2C0F40F008F
FPD6-FR2220679A1.pdf	F2D99D4432847551D0266D910364CCDC86AB1FCA0DCCDCA C27D96B072432CA2E1BCDB0139E1A6B24056A64E5453F7164 7108CDEF6B2F32EDCD4055C3A58AF469
NPL1-Yamaha EF2000iS Tri Fuel Conversion Overview and Installation Tips.pdf	08C823357E7B70012B8B20CEBE4303BD0C70F6C23440ACAFD 352442C1B8F6059E545A8CF67C7239B7F6215E61DE43C2DE1 27FD59B8D88F8EC082B73B76CB48AC

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New International Application Filed with the USPTO as a Receiving Office

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/191,503	Filing Date 11/15/2018	☐ To be Mailed
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ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE (\$)	FEE (\$)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 = *		x \$50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 = *		x \$230 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED - PART II

	(Column 1)		(Column 2)	(Column 3)	RATE (\$)	ADDITIONAL FEE (\$)
AMENDMENT	08/11/2022		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	
	Total (37 CFR 1.16(i))	* 11	Minus	** 20	= 0	x \$50 = 0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0	x \$240 = 0
	☐ Application Size Fee (37 CFR 1.16(s))					
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					
TOTAL ADD'L FEE						0
AMENDMENT			CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	
	Total (37 CFR 1.16(i))	*	Minus	**	=	x \$0 =
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x \$0 =
	☐ Application Size Fee (37 CFR 1.16(s))					
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					
TOTAL ADD'L FEE						
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						/LASHAWN A HINTON/
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**Courtesy Reminder for
Application Serial No: 16/191,503**

Attorney Docket No: CET1090.070

Customer Number: 26629

Date of Electronic Notification: 07/11/2022

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/191,503	11/15/2018	Mark J. Sarder	CET1090.070	6187
26629	7590	07/11/2022		
ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (ZPS)			EXAMINER	
136 S WISCONSIN ST			LATHERS, KEVIN ANTHONY	
PORT WASHINGTON, WI 53074				
			ART UNIT	PAPER NUMBER
			3747	
			NOTIFICATION DATE	DELIVERY MODE
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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MARK J. SARDER, ALEKO D. SOTIRIADES,
JAMES J. DEHN, and LEIGH JENISON

Appeal 2022-001059
Application 16/191,503
Technology Center 3700

Before DANIEL S. SONG, STEFAN STAICOVICI, and
BRETT C. MARTIN, *Administrative Patent Judges*.

SONG, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), the Appellant¹ appeals from the Examiner's decision to reject claims 1–17, 21, 22, and 24.² Final Act. 5–8. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

¹ We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42(a). The Appellant identifies the real party in interest as Champion Power Equipment, Inc. Appeal Br. 1.

² We note that the Examiner's rejection of claim 24 under 35 U.S.C. § 112(a) has been withdrawn. Ans. 9; *see also* Final Act. 3–4.

CLAIMED SUBJECT MATTER

The claims are directed to a dual fuel generator and fuel delivery system. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. A dual fuel generator and fuel delivery system comprising:
 - a dual fuel generator configured to operate on a liquid fuel supplied from a liquid fuel source through a liquid fuel line and a gaseous fuel supplied from a pressurized fuel source through a gaseous fuel line;
 - a fuel regulator system located off board the dual fuel generator, the fuel regulator system comprising:
 - a primary pressure regulator coupled to a service valve of the pressurized fuel source and configured to regulate the fuel supplied from the pressurized fuel source to a reduced pressure; and
 - a secondary pressure regulator coupled to the primary pressure regulator and configured to regulate the gaseous fuel supplied from the primary pressure regulator to a desired pressure for delivery through the gaseous fuel line to operate the dual fuel generator; and
 - a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel generator from the liquid fuel source through the liquid fuel line and the pressurized fuel source through the gaseous fuel line.

Appeal Br. 15 (Claims App.). Claims 11 and 21 are also independent, and include limitations that are similar to those of claim 1.

REFERENCES

The prior art relied upon by the Examiner is:

Name	Reference	Date
NoOutage	web.archive.org/web/20061113112733/http://www.nooutage.com/40248.htm	Aug. 27, 2006
Sugimoto	US 2007/0137591 A1	June 21, 2007
Pursifull	US 2011/0168133 A1	July 14, 2011
GasHose	https://web.archive.org/web/20140517093401/http://gashosesandregulators.com/	May 17, 2014

REJECTIONS³

1. Claims 1–17, 21, and 22 are rejected on the grounds of nonstatutory double patenting as being unpatentable over claims 1–15 of U.S. Patent 10,221,780 B2 (issued Mar. 5, 2019). Final Act. 2–3.
2. Claims 1, 6, 10–13, 16, and 21 are rejected under 35 U.S.C. § 103 as being unpatentable over Pursifull in view of Sugimoto and GasHose. Final Act. 5.
3. Claims 7–9, 14, 15, 17, and 22 are rejected under 35 U.S.C. § 103 as being unpatentable over Pursifull in view of Sugimoto, GasHose, and NoOutage. Final Act. 7.

OPINION

I. *Double Patenting:*

The Examiner rejects claims 1–17, 21, and 22 on the ground of nonstatutory double patenting as being unpatentable over claims 1–15 of U.S. Patent 10,221,780 B2. The Appellant does not argue this rejection, but

³ As noted, the Examiner’s rejection of claim 24 under 35 U.S.C. § 112(a) has been withdrawn. Ans. 9; *see also* Final Act. 3–4.

requests that this rejection be held in abeyance until a determination of allowable subject matter is made. Appeal Br. 13–14. Thus, we summarily affirm this nonstatutory double patenting rejection.

II. *Claims 1, 6, 10–13, 16, and 21:*

The Examiner rejects claims 1, 6, 10–13, 16, and 21 as being unpatentable over Pursifull in view of Sugimoto and GasHose. Final Act. 5. The Appellant only submits arguments directed to independent claims 1, 11, and 21, and argues these independent claims together as a group. Appeal Br. 3, 7, *et seq.* Indeed, although independent claim 1 recites primary and secondary pressure regulators, whereas independent claims 11 and 21 recite first and second stages, there does not appear to be any substantive difference between these terms. Appeal Br. 15, 17, 19 (Claims App.). Therefore, we select claim 1 as representative, and claims 6, 10–13, 16, and 21 stand or fall with claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv).

A. Off-Board Fuel Regulator System

The Examiner rejects claim 1 finding that Pursifull discloses a dual fuel generator substantially as claimed, including being “configured to operate on a liquid fuel supplied from a liquid fuel source through a liquid fuel line and a gaseous fuel supplied from a pressurized fuel source through a gaseous fuel line.” Final Act. 5 (citing Pursifull ¶ 40). The Examiner concedes that Pursifull “fails to disclose a fuel regulator system located off board the dual fuel generator,” or the recited primary and secondary pressure regulators as claimed. Final Act. 5–6.

The Examiner finds that “Sugimoto discloses a dual fuel engine and delivery system (Fig. 1, as shown) wherein the system includes an off-board gaseous fuel system (Fb),” which includes an off-board pressure reducing device. Final Act. 6. The Examiner concludes that it would have been obvious to modify the device of Pursifull in view of Sugimoto “in order to improve the cooling of the fuel system parts through pressure reduction as well as regulate the pressure from an external attached fuel tank which allows the dual fuel engine system to be used in varying situations such as emergency ones using an external fuel source.” Final Act. 6 (citing Sugimoto ¶¶ 2, 10). The Examiner also finds that “Sugimoto does not disclose the exact details of its off-board fuel system, such as the type of tank and regulator it contains.” *Id.* The Examiner further finds that GasHose discloses “twin stage regulators (i.e. two regulators in series),” and concludes that it would have been obvious to one of ordinary skill in the art in light of GasHose to use such a twin stage system with the off-board fuel system of Pursifull, as modified by Sugimoto. *Id.*

The Appellant argues that the art cited by the Examiner lacks a “teaching therein of a fuel regulator system located off board the dual fuel generator — i.e., of both the primary pressure regulator and secondary pressure regulator . . . (claim 1) and/or both a first stage and second stage being located off board the dual fuel generator (claims 11 and 21).” Appeal Br. 8. The Appellant further argues that the fuel regulator system in Sugimoto comprises pressure reducing device 72 and fuel pressure regulator 62, and as such, the “‘fuel regulator system’ in Sugimoto . . . is different from what is called for in claims 1, 11, and 21 where an entirety of a fuel regulator system . . . is located off board the generator.” *Id.* The Appellant

further notes that the “fuel pressure regulator 62 could not simply be removed from the [Sugimoto] generator 1 and combined with pressure reducing device 72 . . . as there would then be no pressure regulator on/in generator 1 that would regulate gas from fuel bottles 61.” Appeal Br. 9.

The Examiner responds that “that the claim does not specify there being no on-board pressure regulation, simply that there exists an off-board pressure regulation.” Ans. 14–15. The Examiner explains that “the proposed modification of Pursifull is not wholesale importation of the entirety of Sugimoto.” Ans. 15. The Examiner further explains that the “modification of Pursifull with Sugimoto is that of the inclusion of Sugimoto’s off-board propane tank systems not *literally all of Sugimoto*,” such that the presence of pressure regulator 62 is not dispositive as to the rejection at hand. Ans. 15.

We agree with the Examiner for the reasons explained by the Examiner. Claim 1 recites a “dual fuel generator and fuel delivery system comprising . . . a fuel regulator system located off board,” which includes a primary and secondary pressure regulator. However, the Appellant incorrectly argues that the claim precludes the provision of another fuel regulator system that is located on board the dual fuel generator. We agree with the Examiner that the recitation of the off-board two stage regulator system for the gaseous fuel supply in the claim does not preclude another regulator system that is on-board, such as regulator 62 in Sugimoto.

The Examiner is also correct that although Sugimoto teaches an off-board pressure reducing device, it is silent as to the details thereof. Thus, the Examiner properly relies on GasHose for teaching a two-stage regulator, for use as the generically taught off-board regulator disclosed in Sugimoto. The Appellant’s further argument, that regulator 62 cannot be moved off-board,

fails because the rejections of claims 1, 11, and 21 do not move or make any changes to regulator 62.

Accordingly, the Appellant's arguments are unpersuasive.

B. Adding a Two Stage Off-Board Regulator:

The Appellant also argues that “one skilled in the art would not . . . modify pressure reducing device 72 [in Sugimoto] from a single-stage regulator to a dual-stage regulator — as such a modification would be unnecessary and duplicative.” Appeal Br. 9. The Appellant further argues that “a dual-stage regulator . . . would only add additional cost and complexity to the generator 1, without providing any additional benefit.” *Id.* The Appellant explains that “two stage pressure regulation is already provided [in Sugimoto] by fuel pressure regulator 62 and a single stage pressure reducing device 72,” so that such a change “may actually cause undesirable pressure reduction of fuel from external fuel bottle 71.” *Id.*; Reply Br. 7. The Appellant “believes the combination to be nothing more than the use of improper hindsight.” Appeal Br. 10.

The Examiner responds that “the device 72 within Sugimoto is never s[t]ated to be a single or dual stage regulator, it is never disclosed in particulars: it is simply disclosed in the most generic term possible, ‘a pressure reduction device.’” Ans. 15. The Examiner explains that as such, one would need to use some type of regulator for the pressure reducing device 72 in providing an off board gaseous fuel system (Fb), and that one of ordinary skill in the art would have chosen a regulator “that is not only common and cheap, but well-known and effective.” Ans. 16. The Examiner finds that the regulator of GasHose provides these qualities and that

GasHose would provide these “benefits regardless of whatever on-board conditions exist in the generator in question.” *Id.* The Examiner also finds that “the device 72 being a dual stage regulator would not harm Sugimoto or alter its system in any way” and that it would not “do anything other than benefit it.” *Id.*

We agree with the Examiner’s findings and conclusion. We agree with the Examiner’s finding that using a two-stage regulator such as that disclosed in GasHose for an off board regulator would have been advantageous because it provides “a more even output control and a reduction in freeze-ups from an off-board fuel system (such as a propane tank).” Final Act. 6–7. Indeed, GasHose specifically teaches that twin state regulators “compensate for the varying tank pressures inside the propane tank and insure an even pressure on the delivery side regardless of the varying demand for gas,” and “has an added benefit of greatly reducing the possibilities of freeze-ups, which would otherwise likely occur more frequently as the btu/hr demand increases.” GasHose 8. In light of these explicitly disclosed advantages, we do not find the combination to employ “the use of improper hindsight.” *See In re Cree, Inc.*, 818 F.3d 694, 702 n.3 (Fed. Cir. 2016) (hindsight argument is of no moment where the Examiner provides a sufficient, non-hindsight reason to combine the references). Thus, the Appellant’s arguments are unpersuasive.

In the Reply Brief, the Appellant also submits various additional new arguments directed to the teachings of Pursifull. Reply Br. 3–4. However, the Appellant’s arguments are not timely and improperly submitted under the Rules. 37 C.F.R. § 41.41(b)(2) (“Any argument raised in the reply brief which was not raised in the appeal brief, or is not responsive to an argument

raised in the examiner's answer, including any designated new ground of rejection, will not be considered by the Board for purposes of the present appeal, unless good cause is shown."'). The Appellant has not made any showing of good cause. Thus, we decline to consider the Appellant's untimely arguments newly raised in the Reply Brief. *See also Ex parte Borden*, 93 USPQ2d 1473, 1473–74 (BPAI 2010) ("informative").

Moreover, in the Reply Brief, the Appellant argues that the Examiner's "reliance on Champion How-To, Chuck Webb, Bassguitarist1985, and Bigredd110 to show the 'state of the art' in the Examiner's Answer is improper . . . [and] their disclosures do not remedy the deficiencies in the combination of Pursifull, Sugimoto, and GasHose." Reply Br. 9. In the "Response to Argument" section of the Examiner's Answer, the Examiner stated that "it would be important to note the *state of the art*," and noted various YouTube[®] videos. Ans. 10–11. The Appellant argues that the Examiner's reliance on new art may be new grounds of rejection, and further submits arguments alleging deficiencies of the noted videos in establishing obviousness. Reply Br. 8–9. However, notwithstanding the fact that this appears to be a petitionable issue, the Examiner did not actually rely on any of the cited videos in the pending rejections as the Appellant asserts. Indeed, the rejection as set forth in the Final Office Action was not altered in the Answer. Ans. 5–8 (reproducing the rejection applied in the Final Office Action). Thus, the Appellant's argument is unpersuasive.

In view of the above considerations, the rejection of claim 1 is affirmed, and claims 6, 10–13, 16, and 21 fall with claim 1.

III. *Claims 7–9, 14, 15, 17, and 22*

The Examiner rejects dependent claims 7–9, 14, 15, 17, and 22 as being unpatentable over Pursifull in view of Sugimoto, GasHose, and NoOutage. Final Act. 7. The Appellant does not submit any substantive arguments directed to these claims except for claims 9 and 15. Appeal Br. 12. Thus, dependent claims 7, 8, 14, 17, and 22, fall with their respective independent claims. We address the Appellant’s arguments directed to claims 9 and 15 below.

Claims 9 and 15 recite that the regulator mounting device secures to a collar such that the regulators are “positioned adjacent each other along an outer periphery of the collar.” Appeal Br. 17–18 (Claims App.). The Examiner finds that the combination of Pursifull in view of Sugimoto and GasHose discloses containers having collars, wherein GasHose specifically discloses a mounting bracket for mounting regulators. Final Act. 8. The Examiner finds that the combination fails to specifically teach the claimed mounting arrangement. Final Act. 8. However, the Examiner finds that “the system of NoOutage is shown with a mounting bracket on the collar of the propane tanks supporting the regulator.” Final Act. 8. The Examiner concludes that utilizing the mounting bracket of NoOutage “is nothing more than a simple substitution of one known element for another.” *Id.* The Examiner explains that “both components perform functions well-known in the art (attaching and maintaining tank regulators) and the substitution [sic] would have been a predictable solution with expected results, then the modification would have been obvious to one of ordinary skill in the art.” Final Act. 8 (citing *Ruiz v. AB Chance Co.*, 357 F.3d 1270 (Fed. Cir. 2004)).

The Appellant argues that GasHose and NoOutage “teach (at best) a single primary pressure regulator positioned between (and shared by) a pair of pressurized fuel containers and that is attached to the containers via a connecting rod extending between the collars.” Appeal Br. 13. The Appellant explains that “neither GasHose nor Nooutage.com has been shown to disclose a regulator mounting device . . . as called for in claims 9 and 15.” *Id.* Appellant further explains that “the connecting rod of Nooutage.com is not secured to a collar of a pressurized fuel container . . . since the connecting rod would clearly fall off the collar of the single pressurized fuel container in Nooutage.com.” Reply Br. 12.

We do not find Appellant’s arguments persuasive because the Appellant appears to argue the prior art references separately and fails to consider what the art teaches to one of ordinary skill. “Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references.” *In re Merck*, 800 F.2d 1091, 1097 (Fed. Cir. 1986); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). As discussed above relative to claim 1, GasHose discloses a two-stage regulator, the benefits thereof, and a mounting bracket for the regulators. Final Act. 6–7; GasHose 8, 9 (GR-905 mounting bracket for twin state regulator), 12 (“Universal Mounting Bracket”). However, GasHose is silent as to securement of the mounting bracket to a collar and the positioning of the regulators adjacent each other along an outer periphery of the collar. As the Examiner finds, NoOutage teaches a regulator having a mounting bracket that is secured to collars. Accordingly, as the Examiner correctly concludes, it would have been a simple substitution to incorporate the mounting bracket of NoOutage to provide mounting of the regulators on

the collar. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) (“[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result.”). Contrary to the Appellant’s assertion, we agree with the Examiner’s finding that because the claims do not specify the manner in which securement is attained, the bracket disclosed in NoOutage can reasonably be considered as being secured to the collar because its attachment thereto is maintained. Ans. 17.

Furthermore, as to the recited positioning of the regulator, merely altering a position of a component in a device, without more, does not render the device patentable. *See In re Japikse*, 181 F.2d 1019, 1023 (CCPA 1950) (specific positioning of a starting switch of a hydraulic power press held unpatentable because shifting the position of the starting switch would not have modified the operation of the device); *In re Kuhle*, 526 F.2d 553, 555 (CCPA 1975) (particular placement of a contact in a conductivity measuring device is an obvious matter of design choice). It would have been obvious to one of ordinary skill and creativity to further position the regulators in the manner recited by claims 9 and 15 as a mere predictable variation and obvious design choice. *KSR*, 550 U.S. at 417 (“When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, §103 likely bars its patentability.”).

Therefore, because the Appellant’s arguments do not persuade us of error, we affirm the rejection of claims 9 and 15 as well.

CONCLUSION

The Examiner's rejections are affirmed.

DECISION SUMMARY

In summary:

Claim(s) Rejected	35 U.S.C. §	Reference(s)/ Basis	Affirmed	Reversed
1–17, 21, 22		Nonstatutory Double Patenting U.S. Patent 10,221,780	1–17, 21, 22	
1, 6, 10–13, 16, 21	103	Pursifull, Sugimoto, GasHose	1, 6, 10–13, 16, 21	
7–9, 14, 15, 17, 22	103	Pursifull, Sugimoto, GasHose, NoOutage	7–9, 14, 15, 17, 22	
Overall Outcome			1–17, 21, 22	

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED



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16/191,503	11/15/2018	Mark J. Sarder	CET1090.070	6187
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Please find below and/or attached an Office communication concerning this application or proceeding.

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MARK J. SARDER et al.

Appeal 2022-001059
Application 16/191,503
Technology Center 3700

APPEAL DOCKETING NOTICE

The Patent Trial and Appeal Board received the appeal in the above-identified application from the Technology Center on December 09, 2021, and has assigned it the appeal number indicated above.

The recipient of this notice is reminded of its ongoing duty, within 20 days of any change during the proceeding, to update its mandatory notices to identify the real party-in-interest and each judicial or administrative proceeding that could affect, or be affected by, the Board proceeding. 37 C.F.R. § 41.8. For example, another docketed appeal in a related application may have the potential to affect, or be affected by, the Board proceeding.

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Customer No. 26629
Confirmation No. 6187

Patent
Attorney Docket No. CET1090.070

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Sarder et al.
Serial No. : 16/191,503
Filed : November 15, 2018
For : OFF-BOARD FUEL REGULATOR FOR GENERATOR
ENGINE
Group Art No. : 3747
Examiner : Kevin A. Lathers

CERTIFICATION UNDER 37 CFR 1.8(a) and 1.10

I hereby certify that, on the date shown below, this correspondence is being:

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37 CFR 1.8(a)

37 CFR 1.10

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- ☐ transmitted by facsimile to Fax No.: 571-273-8300 addressed to Examiner Kevin A. Lathers at the Patent and Trademark Office.
☒ transmitted by EFS-WEB addressed to Examiner Kevin A. Lathers at the Patent and Trademark Office.

Date: November 2, 2021

/Robyn L. Templin/
Signature

Commissioner for Patents
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Alexandria, VA 22313-1450

REPLY BRIEF RESPONSIVE TO EXAMINER'S ANSWER
MAILED SEPTEMBER 7, 2021

Dear Sir:

This Reply Brief is being filed in Response to the Examiner's Answer mailed on September 7, 2021.

REPLY BRIEF

In the Examiner's Answer mailed September 7, 2021¹ (hereinafter - "Examiner's Answer"), the Examiner maintained the rejection of claims 1-17, 21, and 22 on the ground of nonstatutory double patenting as being unpatentable over claims 1-15 of U.S. Patent No. 10,221,780; the rejection of claims 1, 6, 10-13, 16, and 21 under 35 U.S.C. §103 as being unpatentable over Pursifull et al. (US Pub. 2011/0168133 - hereinafter "Pursifull") in view of Sugimoto et al. (US Pub. 2007/0137591 – hereinafter "Sugimoto") and further in view of GasHoseandRegulators (May 17th, 2014, <https://web.archive.org/web/20140517093401/http://gashosesandregulators.com/> - hereinafter "GasHose"); the rejection of claims 7-9, 14, 15, 17, and 22 under 35 U.S.C. §103 as being unpatentable over Pursifull in view of Sugimoto and GasHose, and further in view of Nooutage.com (Aug. 27th, 2006, <http://web.archive.org/web/20061113112733/http://www.nooutage.com/40248.htm>), as set forth in the Final Office Action mailed October 28, 2020 (hereinafter "Final Office Action"). *Examiner's Answer*, pp. 4-5, 7.

Appellant believes claims 1-17, 21-22, and 24 are patentable over the art of record and stands by the positions set forth in its Appeal Brief filed March 29, 2021. Herein, Appellant limits its remarks to the assertions presented by the Examiner in the Examiner's Answer of September 7, 2021, with it being understood that the following remarks are meant to supplement the remarks previously set forth in its Appeal Brief, and that the Appeal Brief includes the fullest and most complete arguments as to why the rejections of the pending claims are improper and cannot be sustained.

Rejection under 35 U.S.C. §103 over Pursifull in view of Sugimoto and GasHose**Claims 1, 11, and 21**

The Examiner rejected claims 1, 11, and 21 under 35 U.S.C. §103 as being unpatentable over Pursifull in view of Sugimoto and GasHose.

In the Appeal Brief, Appellant argued that the combination of Pursifull, Sugimoto, and GasHose does not teach or suggest a fuel regulator system located off board the dual fuel generator, the fuel regulator system comprising a primary pressure

¹ Appellant notes here that, as explained on page 2 of the Examiner's Answer mailed September 7, 2021, the Examiner vacated the Examiner's Answer mailed June 29, 2021 due to an error.

regulator configured to regulate the fuel supplied from the pressurized fuel source to a reduced pressure and a secondary pressure regulator coupled to the primary pressure regulator and configured to regulate the gaseous fuel supplied from the primary pressure regulator to a desired pressure for delivery through the gaseous fuel line to operate the dual fuel generator (claim 1), and/or a fuel regulator system located off board the dual fuel generator, the fuel regulator system configured to: regulate the gaseous fuel down to a reduced pressure and regulate the reduced pressure gaseous fuel in a second stage down to a desired pressure in the second stage for delivery through the gaseous fuel line to operate the dual fuel generator (claim 11), and/or a generator free of any pressure regulator with a fuel regulator system located off-board the generator that regulates gaseous fuel supplied from a pressurized fuel source down to a reduced pressure in a first stage and regulates the reduced pressure gaseous fuel down to a desired pressure in a second stage (claim 21). *Appeal Brief*, 03/29/2021, pp. 3-12. More specifically, Appellant argued that, the fact that Sugimoto only discloses pressure reducing device 72 being off-board generator 1 – with fuel pressure regulator 62 on-board the generator 1 – is clear evidence that the proposed combination of Sugimoto with Pursifull still provides no teaching or suggestion of a fuel regulator system (primary and second regulators (claim 1) or first and second stages (claims 11 and 21) of a fuel regulator system) located off board the generator, as called for in the claims. *Id.* at p. 8. Additionally, Appellant argued that one skilled in the art would not modify Sugimoto in view of GasHose to provide a dual-stage off-board regulator for gaseous fuel bottle 71 – i.e., to modify pressure reducing device 72 from a single-stage regulator to a dual-stage regulator – as such a modification would be unnecessary and duplicative in Sugimoto. *Id.* at p. 9.

In maintaining the rejection of claims 1, 11, and 21, the Examiner stated that “Appellant asserts that, with regards to Sugimoto, ‘there is no teaching therein of a fuel regulator system located off board the dual fuel generator- i.e., of both the primary and [sic] pressure regulator being located off board.’” *Examiner’s Answer*, p. 14 (quoting *Appeal Brief*, p. 8). The Examiner argued that “the proposed modification of Pursifull is *not* wholesale importation of the entirety of Sugimoto. With regards to the rejection, Pursifull *already discloses a dual fuel generator system*. What Pursifull does not discuss or show is how its gaseous fuel system is attached, stored, or operated.” *Id.* at p. 15.